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FORTIETH

ANNUAL

REPORT

OF THE

1891

BOARD OF WATER COMMISSIONERS



DETROIT, MICHIGAN.

PRESENTED BY

TO THE

COMMON COUNCIL OF THE CITY OF DETROIT

FOR THE YEAR

1891.

1875

FORTIETH ANNUAL REPORT

OF THE

Board of Water Commissioners

TO THE

COMMON COUNCIL OF THE CITY OF DETROIT

TOGETHER WITH THE

REPORTS OF THE OFFICERS OF THE BOARD

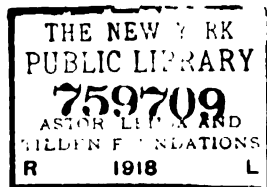
FOR THE YEAR 1891.

DETROIT:

THE DETROIT FREE PRESS PRINTING COMPANY.

1892.

Ch. 11



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BOARD OF WATER COMMISSIONERS,

DETROIT, 1892.

MEMBERS:

JOSEPH L. HUDSON, 1892.

AUGUST GOEBEL, 1894.

SAMUEL G. CASKEY, 1893.

HENRY M. DUFFIELD, 1895.

***FRANK E. KIRBY, 1896.**

*John Pridgeon term expired and Frank E. Kirby was appointed to fill vacancy.

COMMITTEES:

WAYS AND MEANS.....Commissioners KIRBY, CASKEY.

EXTENSION AND CONSTRUCTION..Commissioners CASKEY, HUDSON.

PUMPING WORKS.....Commissioners GOEBEL, KIRBY.

SUPPLIES.....Commissioners HUDSON, GOEBEL.

OFFICERS:

PRESIDENT.....HENRY M. DUFFIELD.

VICE-PRESIDENT.....AUGUST GOEBEL.

SECRETARY.....L. N. CASE.

SUPT. OF EXTENSION AND CONSTRUCTION..HENRY BRIDGE.

SUPT. OF METERS AND INSPECTION.....THOMAS R. PUTNAM.

SUPT. OF GROUNDS..... E. A. SCRIBNER.

CHIEF ENGINEER JOHN E. EDWARDS.

ASSISTANT ENGINEER.....URIAH GOULD.

METER CLERK.....HARRY S. STARKEY.

MAX F. GREUNER.

ALBERT W. GOODSELL.

ANTHONY T. McLOGAN.

FRED. H. HUTAFF.

HARRY L. JAMES.

AUGUST GOEBEL, JR.

JNO. J. ROBINSON.

PETER S. BECKER.

RECEIVING CLERK.....GEORGE E. KUNZE.

PERMIT CLERK.....ARTHUR STORM.

DETROIT WATER WORKS.

METER RATES.

First 3,000 Cubic feet, each month, each 100 gallons.....	$\frac{3}{4}$ of a cent.
All over, each 100 gallons.....	$\frac{1}{4}$ of a cent.
Minimum rate, per annum.....	\$9 00

ASSESSMENT RATES.

FROM JULY 1st, 1893.

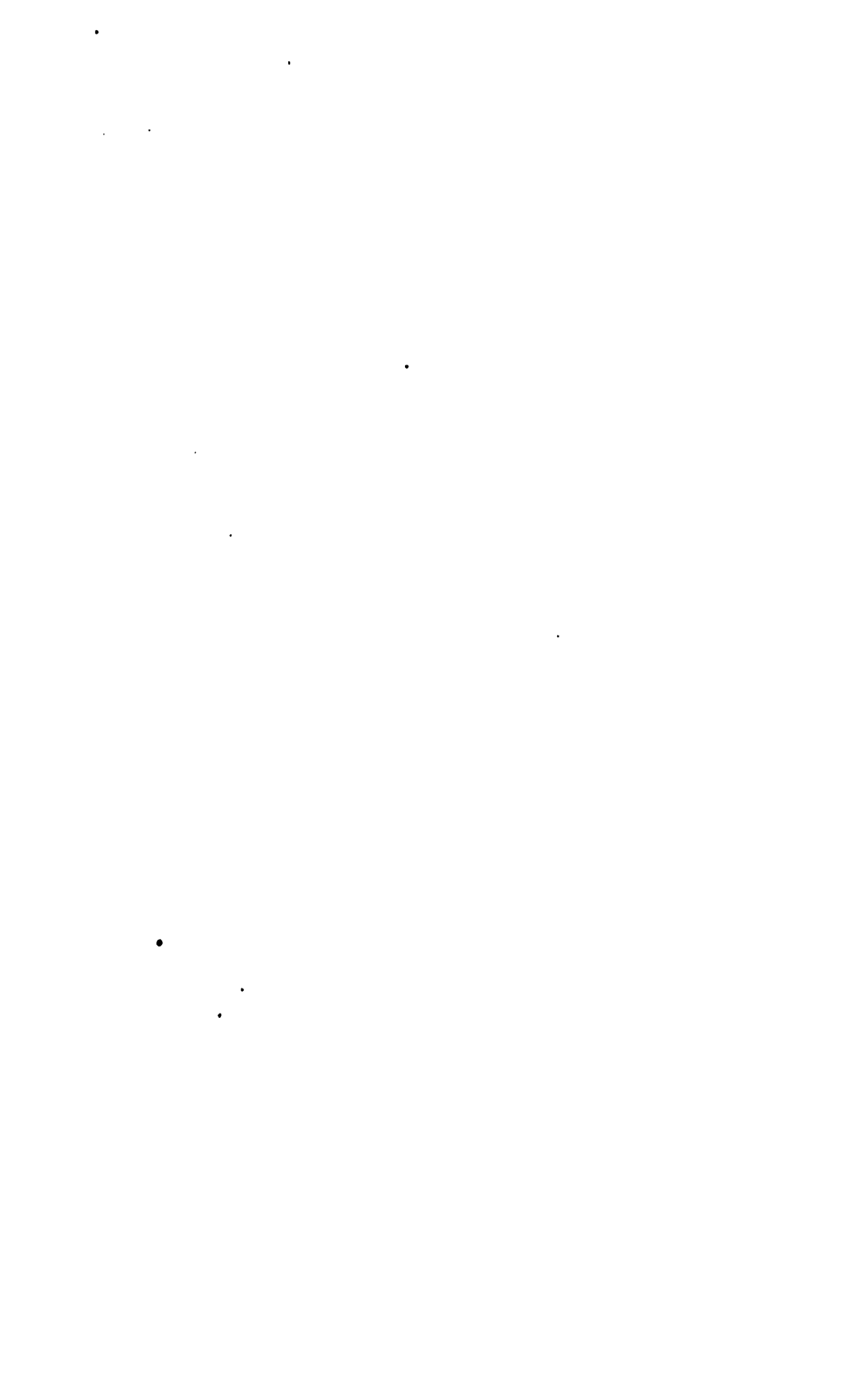
	PER ANNUM
For Family, household purposes.....	\$5 00
Green Houses.—Special rates.	
Private Stables, for each horse.....	2 00
Livery Stables, " " ".....	2 00
Dray and Team Horses, each.....	1 00
Cows, each.....	1 00
Stores and Offices.....	\$3 00 to 30 00
Bakeries, average daily use, for each barrel of flour.....	2 50
Saloons, Groceries and Provision Stores, from.....	\$3 00 to 100 00
Bar, with faucet, from.....	8 00 to 30 00
Fish Houses.....	10 00 to 100 00
Slaughter Houses.—Special rates.	
Hotels and Taverns, in addition to family rate, each room.....	1 00
Boarding Schools, each room.....	1 00
Public Schools, from.....	\$5 00 to 30 00
Building Purposes, each 1 M brick.....	5
" " " 100 yards plastering.....	10
" " " per sq stone.....	1 $\frac{1}{2}$
Printing Offices, Special rates.	
Butcher Stalls, each not less than.....	3 00
Workshops, for 10 persons or under.....	3 00
" for each additional 10 persons.....	1 00
Estimated quantities of water each 100 gallons.....	2
Boarding Houses, in addition to family rate, each boarder.....	1 00

FIXTURES.

Bath Tubs, for families, 1st tub, \$2.00; each additional.....	\$1 00
Bath Tubs, public, each tub.....	5 00
Water-closets, for a family, 1st closet, \$2.00; each additional, \$3 00,	
	\$3 00 to 15 00
Water-closets, for Hotels, Stores, Factories, etc., for 10 persons, \$5.00; each additional person.....	25
Hot Water-closets, not less than.....	5 00
Urinals, not less than.....	2 00
Wash-Hand Basins, for family.....	\$1 00 to 3 00
" " " for other purposes, each person.....	25
Permanent Wash Tubs.....	2 00
Hose, for street and lawn sprinkling.....	no charge.
" for other purposes, minimum charge.....	3 00
Fountains.....	\$5 00 to 30 00
Street Sprinklers, each wagon.....	200 00

Where there is a waste of water a proper increase of rates will be made.

REPORT OF THE COMMISSIONERS.



REPORT
OF THE
BOARD OF WATER COMMISSIONERS
OF THE
CITY OF DETROIT.

WATER COMMISSIONERS' OFFICE.

DETROIT, January 19, 1892.

To the Common Council of the City of Detroit :

The Board of Water Commissioners respectfully submits its annual report for the year ending December 31, 1891.

A detailed statement has already been presented by the Secretary to your honorable body, showing the entire expenditures of the Board during the year. This statement gives the number of the voucher upon which the payment is made, the name or names of those to whom it is paid, the service or material paid for, and the payment itself.

The bonded indebtedness of the Board is \$1,229,000, upon which is an annual interest of \$76,610.

One hundred and forty-six thousand dollars of these bonds will fall due August 1, 1893, and there will be in the sinking fund at that time about \$75,000, the accumulated surplus from the general tax levy, to assist in their redemption, leaving only \$71,000 to be taken from the general fund.

The total expenditures of the Board were \$508,255.20, and the receipts were \$492,457.45, an excess of the former over the latter of \$15,797.75.

During the last two years the Board have been called upon to expend a much larger sum than is usual in the extension of its pipeage system.

In 1890, the Board, as already reported, laid a considerable amount of its larger sized supply mains throughout the central and business portions of the city.

During the past year, the large annex to the city caused the laying of pipe through much of this new territory, the laying of a large supply main up Collins from Fremont street to the Boulevard, thence west to Grand River avenue; also a large main out Woodward to the new city limits. The expense for iron pipe alone the last two years was \$538,270.43.

The expense during the ensuing year in this direction will by no means be as great. The total amount of pipe laid during the year was over 43 miles, double that of any previous year, excepting that of 1890, when it was over 25 miles.

During the year the Board determined to discontinue the use of the settling basin at the pumping works, long enough at least to pump the water therefrom and inspect its condition.

As soon as the water was drawn out, the entire Board visited the works and carefully inspected the basin, and the character and quantity of the deposits that had accumulated therein.

Much to the surprise of the Board there was nothing there of an offensive nature, or that indicated any appreciable accumulation of organic matter.

It had served, however, a valuable purpose in causing the precipitation of earth or sand, of which there was an accumulation of about one and one-half feet, since its construction fifteen years ago.

It also causes the precipitation of grass or weeds that is carried along in the water, and which during the year is constantly being raked up and carried away by men employed for that purpose.

The water was ordered to be let into the basin again and the Superintendent of Construction instructed to submit to the Board, at some future day, some simple and practicable plan for a permanent renewal of the west wall of the basin and the

dock along the same, which is now in a very dilapidated condition.

During the past year the Board has had, what is called "Inlet pipe No. 1," taken up, relaid, and extended 500 feet further into the river. A conduit of brick, 200 feet in length, was built from the basin to connect with this inlet pipe.

The cost of the former work was \$11,020.47, and that of the latter \$9,524.39.

During the past year the Board deemed it advisable, thinking it could reduce its income to that extent, to remove the assessments on hose used for street and lawn sprinkling. The total assessments on hose, then upon the books, amounted to \$20,000.

The result was that a great many purchased and used hose that had not done so before, and those who already had hose seemed to use them more lavishly than ever before. Eight million gallons of water was pumped on an average each day into the city to supply this use alone, some days or portions of days, the engines were pumping at the rate of between fifty and sixty million gallons of water, the extreme limit of our capacity to supply.

The Secretary recommends that certain restrictions be made that will prevent such extravagant use, and it may be advisable to adopt something of this nature, rather than enter into a large expense to increase our pumping facilities, as urged by the Engineer, simply to supply this demand and no other, as the total quantity pumped each year is steadily and surely decreasing.

There has been quite recently considerable discussion in the papers and among manufacturers and business men, in regard to the water rates of the Board, and considerable feeling has been displayed, and wrong impressions created in this discussion.

In the first place there seemed to be a lamentable ignorance as to what the rates for water really were, and some of our manufacturers have denounced the rates as oppressive, and cited in proof thereof that the excessive charges for water had forced them to go to considerable expense to put in a plant of their own rather than submit to the burden imposed upon them.

Each of these cases took place at a time when the rates of the Board were *three times larger* than they are to-day, and yet no indication was given of any approval or even knowledge of such a large reduction, and yet which should have been a matter of common information.

It was frequently charged that water rates were less in Chicago, Toledo, Cleveland, Philadelphia and Baltimore, when in fact every one of the foregoing cities charges at least double and some three and four times as much as the rates in Detroit.

We instructed our Secretary to procure the rates of all the prominent cities and have them published in the daily papers, which was done, and which had the effect of stopping almost entirely this unreasonable hue and cry.

In our report to your honorable body, written two years ago, these words were used: "*The Board have carefully considered the subject of meter rates, and being impressed with the idea that the manufacturing and business interests of the city, upon which we depend largely for our common prosperity, should be protected and conserved as far as it was reasonable and just, at a special meeting in September (1889) made a reduction of 33½ per cent. in its rates. And we desire further to say, that should it be at any time in the future demonstrated to us that a further reduction can be made, we will cheerfully and gladly comply therewith.*"

We recall these words simply to show our fellow citizens that, long before the present agitation of this subject, the Board of Water Commissioners were giving this very matter careful study, and have been aiming ever since to give to the people of Detroit, that which is demanded to-day, "*cheap water.*" And we have accomplished it too, to a certain extent; for in less than two years the water rates have been reduced to *one-third* of what they were.

Unjust and unreasonable criticism from our fellow citizens, whom we are serving, with the only compensation therefor but the hope and the wish to so execute the great trust reposed in us as to best conserve their true interests, is certainly not pleasant nor is it merited.

His Honor, the Mayor, in his annual message to your honorable body, speaks of the old fogysm of the past in connection with the fact of the laying of wooden pipe several years ago, and which your present Board is now replacing with iron. Is it not true in all other matters as well as in this, in private and public life, that in advancing along the line of thought and enterprise that the wisdom of yesterday is the old fogysm of to-day, and the wisdom of to-day will be the old fogysm of to-morrow? "The evils that men do live after them, but the good is often interred with their bones." Let us not be ungrateful to the men who have passed away, nor too critical of those labors that were undoubtedly performed with all the wisdom of their time.

His Honor, the Mayor, also says that he fears that the Board is erring some in investing so much in meters, and says that an engine of almost unlimited capacity could be purchased for the amount invested in these appliances.

If it had been a question of purchasing an engine only, your Commissioners would not have hesitated a moment.

The cost of a pumping engine is but a tithe of the expenditures required to keep pace with an ever increasing consumption and waste.

To illustrate our meaning, your attention is invited to the following statement:

YEARS.	FAMILIES SUPPLIED.	WATER PUMPED.	PER FAMILY.
1868	11,554	1,666,545,125	144,239
1878	20,608	4,345,743,330	210,927
1888	36,863	14,380,166,670	390,094
1891	43,983	12,057,261,236	273,080

The first three lines illustrate how much more rapidly consumption increases than the population, when there is an unrestricted use. The last line shows what the meters have accomplished, in not only stopping the growing percentage, but also in largely reducing it. Now let us state another fact, and that is that the cost of running the water department of any city,

depends largely upon the quantity of water which the works are called upon to supply. If the supply can be reduced, so can the cost. If the cost can be reduced, so can the rates for water, and that precisely is what your Commissioners are doing to-day.

In continuation of this question of an outlay that was required in the spring of 1889, let us take a pencil and put down a few items. It was estimated at that time that the expense of another engine, another large supply main from the works to the city, which by the way is needed more than an engine, a new engine house, etc., would have cost the Board \$600,000.

Now the interest upon this amount for three years would have been a necessary expense, and at 4 per cent. per annum, would have amounted to \$72,000. The increased operating expenses would have been at least \$30,000 more, making a total of \$102,000.

Now the expense actually incurred was for meters in 1889, \$13,644.41, the interest upon which for three years was \$1,637.32; for meters in 1890, \$30,601.68, the interest upon which for two years was \$2,448.13, and for meters in 1891, \$12,413.14, upon which the interest for one year would have been \$496.52. The total for the three years' operations then was \$4,581.97.

We have given the entire expense of this department, Superintendent and repairs included, but have not made any calculations on the depreciation of the values of the meters, neither did we make any calculations on the depreciated valuations of the construction contemplated, which would have been much more.

Now what do we have as a result of our calculations? An expense of \$4,581.97 has saved an expense to the city of \$102,000, and which expense ever increasing and expanding would have been fastened on us for all time to come.

In conclusion we have to say that we do not ask for blind confidence, nor do we wish to be blindly and unreasonably criticized, but we do ask our fellow citizens to judge us by the facts, and that our efforts to serve the *whole* people irrespective of class or calling be properly appreciated.

It would not be proper for us to enter into the discussion as to whether the works should be self supporting or not, that is a question to be decided by your honorable body, but that it has been so far, is a matter of pride and approval with many of our citizens, and is a condition that every other city in the United States is striving to attain.

We point to our operating expenses with a just pride, inasmuch as it has no equal, even among those cities whose facilities for obtaining water are as good as they are in Detroit.

We respectfully refer you to the accompanying reports of the Secretary and the several heads of departments.

All of which is respectfully submitted.

HENRY M. DUFFIELD,
AUGUST GOEBEL,
S. G. CASKEY,
J. L. HUDSON,
FRANK E. KIRBY,

Commissioners.

REPORT OF THE SECRETARY.



Report of the Secretary.

DETROIT, January 2d, 1892.

To the Board of Water Commissioners :

GENTLEMEN:—I have the honor to submit the Secretary's report of the general operations of the Works during the past year, as well as a complete *resume* of its financial transactions.

I have been impressed with the desire of the Board to render the Works as complete and perfect in its operations as possible, and to that end have introduced into its various departments such disciplinary regulations as seemed to me necessary.

I have also given careful heed to the various complaints that have been made to me, in regard to "short supplies" and "impure water." These complaints have been in every case thoroughly investigated, and as a result I soon became aware that certain portions of the city were supplied with a much larger head than was necessary, and certain other portions with a considerably smaller head than the mechanical and household purposes, or uses, actually required.

In order to arrive at a correct knowledge of these *heads* or pressures, I had placed, through the courtesy of the Fire Department, pressure gauges in various of their engine houses, and a record has been kept ever since of the pressures at each place every hour in the day.

These gauges in the month of July, which was the first month they were in operation, showed the following facts:

complished to any great extent by the use of the settling basin at the Pumping Works. This conclusion was sustained by the condition in which the basin was found on the 6th of last November, when the water was pumped out and inspected by the Board. Your honorable body has at various times considered the question of constructing a new settling basin, but have concluded not to do so, I believe, because the expense would be much greater than any good to be attained thereby. The question has occurred to me as to whether the water could not be more thoroughly strained before pumping it into the city than is now accomplished by the strainer at the ends of the inlet pipes, and in the gate wells. Soon after the pumping out of the basin I suggested to Supt. Bridge the plan of extending a strainer completely across the basin, the meshes or openings to be so fine as to force the whole surface of the strainer to be in use to allow the necessary quantity of water to pass. This would not only strain the water far more thoroughly than now, but would also accomplish more perfectly, what is sought for by the use of the bulk head, spreading the flow of water over the entire width of the basin. Mr. Bridge approved of the idea, and no doubt will recommend it to your attention.

PUMPING WORKS.

It will seen by the report of the Chief Engineer that less water was pumped than in the year previous, notwithstanding the rapid growth of the city. This indicates something of that which has been accomplished in still further reducing the waste, though not entirely. The action of the Board in removing the charge upon hose used for street and lawn sprinkling, had the effect of almost if not quite doubling the number of hose in use, and also causing a more lavish and extravagant use of the same. A comparison between the quantity pumped in November and December, and that of July and August, will give some idea of the immense quantity used for sprinkling. The average pumped in November daily was 28,755,869, and that in December 30,113,603 ; while that of July was 37,020,418, and

that of August 39,141,427. It will be argued that the G. A. R. National Encampment in August largely increased the consumption, but this was not sufficient to any more than possibly increase the daily average for the month about one million. Deducting this and averaging the two months we find that there was pumped each day in July and August 8,000,000 gallons of water more than the average pumped in November and December.

While it was a sufficient sacrifice on the part of the Board to abate the charges for hose, which amounted in 1890 to \$20,000, it has been called upon to make that sacrifice greater by a recommendation of the engineer to purchase another engine simply to supply the exorbitant demand in the summer months. In Mr. Edwards's report he urges upon the Board the necessity of having increased facilities for pumping, notwithstanding the fact that the whole quantity that was pumped during the year was less than it has been in the last five years.

The following statement shows the amount of water pumped during the last six years :

1886.....	10,576,571,254	gallons
1887.....	13,168,859,808	"
1888.....	14,380,166,670	"
1889.....	12,875,334,453	"
1890.....	12,120,944,532	"
1891.....	12,057,261,236	"

I consider that the generosity of the Board has been grossly abused, and I recommend that some radical restrictions be made in the use of the hose, either in regard to length of time of such use, or the time of day in which they will be permitted to be used.

I certainly am opposed to seeing the Board drawn into the expense of another engine, and which means another house, engineers, etc., when it is a fact that through the operations of the Board in stopping the waste, the work required at the pumping station is steadily *decreasing*, and has been since

1888, during which year the Board pumped over six million gallons daily more than was pumped last year.

Under the direction of the Committee on Pumping Works, I prepared the following rules for the government of the officers and men employed at the Works :

RULE I.

The Chief Engineer shall have charge of the Engine House, and all of the means and appliances constructed and used for supplying water to the city.

RULE II.

The *First, Second and Third* Assistant Engineers shall in turn, eight hours out of each twenty-four, have direct charge of the engines, boilers and other means used in pumping water, and the Engineers, firemen and other employees engaged in said work shall obey the orders of the Assistant in charge only.

All orders or instructions from the Chief Engineer must be given the men through the Assistant-in-charge, in order that there may be no confiction.

This rule not to apply in moments of extreme danger or peril when the Chief Engineer is present.

RULE III.

The Engineers and Firemen may be excused from duty in the discretion of the Chief Engineer, but the Assistants must in no case be absent from the Engine House during the hours they are in charge of the same, unless it be on a matter of grave importance to the Works, or in case of sickness to self or family.

RULE IV.

All the employees of the Pumping Works as aforesaid, with the exception of the Chief Engineer, shall give their services during the hours of the day arranged for them by the Chief Engineer. During the other hours of the day, as long as they conduct themselves in a decent lawful manner, they are independent citizens, and can do as they please, and live where

they please, without reference to the Board or any of its Officers.

RULE V.

The telephone boy is employed by the Board for the sole purpose of *minding the telephone*, and such other duties as may be required of him, that will not cause him to absent himself from the vicinity of the telephone room. The Chief Engineer and the Superintendent of the grounds will keep him apprised of their locality during the hours of the day as fully as possible, in case they are called for.

RULE VI.

The Superintendent of the grounds, as such, is subject only to orders from the Board, or their Secretary, as provided for in the Regulations of the Board. In his capacity as Assistant or Clerk to the Chief Engineer, he will be subject to the instructions of that official, and perform his duties as such, as he, the Chief Engineer, may direct.

RULE VII.

The watches of the three Assistants are arranged as follows:

First Assistant,	-	from 7 A. M. to 3 P. M.
Second "	-	" 11 P. M. " 7 A. M.
Third "	-	" 3 P. M. " 11 P. M.

This arrangement must not be changed without permission from the Office of the Board.

EXTENSION AND CONSTRUCTION.

As will be seen by the report of Mr. Bridge, Superintendent of this department, over 43 miles of iron pipe were laid during the past year.

The operations of the Board for the two past years in this respect, have been very extensive, making an additional pipe-age of over 68 miles. The cost to the Board of the above extension was in 1890, \$258,165.65, and in 1891, \$280,104.78, or a total of \$538,270.43.

I am very happy to state that the extensions required in the ensuing year will by no means be so large, in fact, that not over one-half the amount of pipe contracted for, for the year 1891, will be necessary for 1892.

METERS AND METER RATES.

As will be seen by Superintendent Putnam's report, about 400 additional meters have been placed during the year. The work in this department has progressed in a careful, painstaking manner, and certainly merits the full approval of the Board. The introduction of meters in this city has necessarily required the greatest care and courtesy on the part of the Superintendent of that department and the employees under him; and from the fact that but little indignation or opposition has been expressed or felt at what some considered an unnecessary innovation, there can be no doubt as to the good conduct of this work.

His report is full of interesting details, and I respectfully invite your careful attention to it.

The continual good effect of the further introduction of meters can best be understood by a close inspection of the accompanying table.

The cost of maintenance appears by this statement to be much less than the preceding year, but is really due, almost entirely, to the fact that I have eliminated from the Operating Expenses certain items that have hitherto been included therein, but which do not properly belong there. Practically, this expense was about the same as that of 1890.

COMPARATIVE STATEMENT.

	1887.	1888.	1889.	1890.	1891.
Daily average consumption in gallons.	36,079,166	39,397,716	35,374,888	33,908,067	33,033,593
Daily average consumption per capita..	197	204	179	155	144
Total consumption in the year	13,168,859,408	14,380,166,670	13,875,334,453	12,120,914,533	12,057,361,336
Consumption through meters.....		91,750,000	139,090,000	636,944,765	1,194,842,400
Percentage of water metered.....		.004	.01	.064	.10
Revenue from unmetered water.....	\$316,676.89	\$335,140.00	\$354,016.00	\$350,599.73	\$342,395.89
Revenue from metered water.....	\$6,154.20	\$9,175.00	\$13,909.00	\$37,373.00	\$46,684.08
Per thousand gallons metered water...			.10	.059	.083
Per thousand gallons unmetered water.			.027	.030	.031
Number of families supplied.....	84,486	86,963	89,158	41,467	43,933
Number of service connections.....		81,891	37,725	40,851	43,737
Miles of distributing pipe.....	807	335	343	363	405
Number of meters, indicators, etc.....		43	304	366	1,339
Expense of maintenance.....	\$106,613.73	\$101,019.00	\$102,537.00	\$103,391.00	\$93,591.54

On the 22d of December last, under instructions from the Board, I prepared a statement for publication in the daily papers of the city, showing the cost of water when metered, in a number of the larger cities of the United States. This statement is included herewith, and is based upon the meter rates of the several cities named, and which are on file in this office.

Buffalo being the only city which has a meter rate for manufacturers less than that of Detroit, a comparative statement of certain conditions in the two cities is also attached. By an examination of these conditions, I think it is obvious that the meter rates in Detroit of $3\frac{1}{2}$ cents per 1,000 gallons is much cheaper than at 3 cents in Buffalo; that is as far as the respective Water Works are concerned. Buffalo has to maintain only one-ninth as many meters as Detroit, and pumps, through this one-ninth, about four times as much water as Detroit does through its larger number, making the cost of maintenance in Buffalo as compared to that of Detroit of *one* to thirty-six. Buffalo also secures from the general tax levy \$25,000 more than Detroit.

COMPANIES	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	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COMPARATIVE STATEMENT.

	DETROIT.	BUFFALO.		DETROIT.	BUFFALO.
Number of meters January 1, 1901	866	94	Rate per 1,000 gallons for same	3 cents.	3½ cents.
Consumption through meters, gallons.	688,944.765	3,284,092.300	Per capita supply, gallons, daily	155	186
Meter rates, per 1,000 gallons.	3½ cents.	3 cents.	Miles of pipe	308	308
Total collected from meters in 1900	\$37,374.00	\$67,107.00	Number of service connections	40,331	40,331
Unmetered water, gallons.	11,463,960.797	14,413,960.110	Received from general tax levy	\$75,000.00	\$100,000.00
Received for same	\$301,560.73	\$404,944.06	(Operating expenses.	\$60,943.73	\$143,091.79

This comparative statement is made from the reports from both cities for the year 1890, and by consulting the table upon a foregoing page it will be seen the number of meters has increased in Detroit to 1,239, and the rate received for each 1,000 gallons of metered water is three and four-fifths ($3\frac{4}{5}$) cents, and the rate for each 1,000 gallons unmetered water is three and one-tenth ($3\frac{1}{10}$) cents.

In order to show the exact saving accomplished by the introduction of meters, your attention is invited to the following tables. The first table shows the number of families in the city in the different years as shown, and the actual quantity of water pumped. By consulting the engineer's table it will be found that in the last three years it has cost \$4.50 on an average to pump one million gallons of water. In the second table is given the quantities of water that would have been pumped had the uses of water continued unrestricted as formerly. These quantities are, of course, estimated, but so steadily and so systematic has been the increase in the amount pumped from year to year, that one cannot go far astray in estimating the quantity that would have been pumped under similar circumstances. According to these figures the actual money saved in pumping water alone exceeds the entire expense of purchasing and placing all the meters introduced by the Board by \$15,501.

Now the only fault that can possibly be found in these figures is in the *estimated* quantity of water pumped each family, but as the ratio of increase from 1878 to 1888 was simply carried along into the next three years, it does not seem that even this can be wrong. This is in addition to the enormous amount saved in interest as given in the Commissioner's report.

Now let us aggregate the saving. First the interest on the expenditure required to extend the Works, \$72,000, to which add the difference between the meters and the cost of pumping as above, \$15,501, and then add to this the value of the meters in operation, on hand, tools, etc., which amounts to \$50,-187.49, and we have as a result of this "mistake" of the Board, the grand total, or saving of \$137,688.49 in three years.

COMPARATIVE SCHEDULE OF METER RATES IN DIFFERENT CITIES.

(CONSUMERS	(Gallons Consumed in November.	Detroit.	Chicago, Ill.	Albion, N. Y.	Cleveland.	Albany, N. Y.	Brooklyn.	Philadelphia.	St. Paul, Minn.	Kansas City, Mo.	Providence, R. I.	New York City.	Milwaukee.	Boston.	Denver, Col.	Toledo, O.	Buffalo, N. Y.
Mechanic Car Company ..	3,033,000	\$131.85	\$317.94	\$449.05	\$293.70	\$106.65	\$308.80	\$314.64	\$403.80	\$375.57	\$605.62	\$334.40	\$234.43	\$354.85	\$350.98	\$227.08	\$117.99
Quaker Brewing Company.	3,093,000	106.45	340.94	357.05	213.70	154.15	308.80	346.64	316.80	399.07	479.11	416.25	171.13	465.95	397.90	187.75	92.49
Detroit Steel and Spring Works.	2,736,000	91.95	323.18	322.35	183.90	136.90	273.60	218.98	281.00	267.84	427.06	344.81	180.96	427.17	274.08	170.40	83.08
Russell House.	2,301,350	74.12	179.40	266.84	144.34	280.12	320.19	176.39	228.13	219.71	346.85	293.50	132.44	354.30	286.34	142.67	66.04
Hammond, Standish & Co	1,722,750	64.17	151.12	321.03	116.34	96.18	173.26	157.82	180.36	176.65	275.07	299.69	106.92	277.64	300.22	116.35	51.68
Daniel Scotten & Co.	1,459,750	49.37	130.00	193.40	96.74	73.98	145.87	116.70	153.88	152.89	235.47	194.50	108.69	285.30	176.99	100.77	43.76
Traugott Schmidt.	890,500	29.10	66.54	130.81	56.70	43.52	85.05	64.04	96.05	99.14	144.26	113.40	60.40	136.03	136.80	63.23	26.51
Detroit Gas Light Comp'y.	441,000	15.45	36.58	71.57	30.90	22.05	44.10	35.95	53.10	60.70	82.80	58.80	38.54	72.99	73.55	26.97	13.28
Detroit Edge Tool Works.	292,000	10.15	25.78	52.50	30.30	14.10	36.30	22.56	36.90	43.44	56.40	37.60	30.06	47.12	49.80	24.06	8.46
Emery Wheel Works.	153,000	5.45	15.80	28.95	11.70	7.65	15.30	13.34	19.26	27.49	31.60	30.40	17.66	26.46	30.60	13.74	4.59

COMPARATIVE STATEMENT.

	DETROIT.	BUFFALO.
Number of meters January 1, 1901	866	94
Consumption through meters, gallons.....	663,944,765	2,295,092,300
Meter rates, per 1,000 gallons.....	3 1/4 cents.	3 cents.
Total collected from meters in 1900.....	\$37,574.00	\$67,107.60
Unmetered water, gallons	11,468,999,767	14,418,490,110
Received for same	\$260,669.73	\$468,944.06
Rate per 1,000 gallons for same	3 cents.	3 1/4 cents.
Per capita supply, gallons, daily	185	166
Miles of pipe	808	803
Number of service connections	40,361	40,331
Received from general tax levy	\$75,000.00	\$100,000.00
Operating expenses.....	\$90,948.79	\$143,091.79

This comparative statement is made from the reports from both cities for the year 1890, and by consulting the table upon a foregoing page it will be seen the number of meters has increased in Detroit to 1,239, and the rate received for each 1,000 gallons of metered water is three and four-fifths ($3\frac{4}{5}$) cents, and the rate for each 1,000 gallons unmetered water is three and one-tenth ($3\frac{1}{10}$) cents.

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ACTUAL OPERATIONS OF THE WORKS.

YEARS.	FAMILIES AS- SESSED.	WATER PUMPED.	TO EACH FAMILY.	REMARKS.
1868	11,544	1,666,545,125	144,000	Ratio increased in the ten years, 31 per cent. Ratio increased, 40 per cent. Commenced metering. Ratio decreased, 16 per cent. Ratio decreased, 10 per cent. Ratio decreased, 6 per cent.
1878	20,603	4,845,748,830	210,000	
1888	36,863	14,880,166,670	890,000	
1889	39,158	12,875,834,453	828,000	
1890	41,467	12,120,944,532	292,000	
1891	43,933	12,037,261,236	274,000	

ESTIMATED UPON SAME RATIO OF INCREASE AS PREVIOUS 10 YEARS.

YEARS.	TO EACH FAMILY.	TOTAL PUMPED.	EXCESS OVER ACTUAL AMOUNT.	WHICH AMOUNTS TO, AT \$4.50 PER MILLION.	TOTAL EXPENSE FOR METERS.
1889	408,000	15,976,464,000	8,101,139,547	\$18,954.00	\$18,644.41
1890	426,000	18,064,942,000	5,948,997,468	26,748.00	80,601.68
1891	444,000	19,506,252,000	7,448,990,764	38,516.00	14,466.21
				\$74,318.00	\$58,712.80

PLUMBERS AND PLUMBING.

Upon the recommendation of Supt. Putnam and myself a resolution was adopted, by your honorable body, doing away with the practice of requiring a certificate from an examining board before a license was granted; also the issuing of two classes of licenses.

We both believe that the introduction of the above innovations has been productive of much good, but that the reasons for maintaining them longer are not commensurate with the trouble they cause, and the misunderstanding arising therefrom.

Hereafter licenses will be issued to master plumbers, as required by your regulations, to do all kinds and character of work, and their work carefully inspected, and every one held strictly in accordance with the requirements of the Board as to material and workmanship.

FINANCIAL STATEMENTS.

The *receipts* during the year have been as follows:

WATER RATES ACCOUNT :	
Rates paid.....	\$389,079 97
PERCENTAGE ACCOUNT :	
From delinquents.....	6,101 58
Penalties for shutting off	860 50
CITY OF DETROIT ACCOUNT :	
General tax levy.....	72,528 36
INTEREST ACCOUNT :	
Deposits general fund.....	4,284 18
Deposits, sinking fund.....	757 07
REAL ESTATE ACCOUNT :	
Rents for office building.....	1,762 50
Rents for old pumping works.....	1,500 00
REPAIRING LEAKS ACCOUNT :	
Labor.....	45 97
SERVICE COCKS ACCOUNT :	
Stops, drilling and fines.....	7,507 92
IRON PIPE ACCOUNT :	
Laying pipe.....	3,642 68
Material and labor.....	3,037 70
Sale of dross.....	110 50
PLUMBERS' LICENSES ACCOUNT :	
Paid for licenses.....	560 00

STOP COCKS :

Sale of old material.....	\$5 75
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PUMPING WATER ACCOUNT :

Sale of ashes.....	168 63
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Sale of old material.....	12 39
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Overpaid on coal.....	178 95
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OFFICE ACCOUNT :

Sale of old material... ..	12 90
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NEW PUMPING WORKS :

Ice privilege.....	100 00
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Rent of slip.....	250 00
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Total receipts.....	<u>\$492,457 45</u>
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The following are the *expenditures* of the Board, arranged under their different heads, as follows :

CONSTRUCTION.**IRON PIPE ACCOUNT :**

Superintendency and clerks.....	\$5,838 35
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Labor.....	90,507 35
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Iron pipe.....	152,001 48
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Specials.....	10,001 57
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Hauling.....	3,152 48
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Lumber....	836 68
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Coal.....	190 53
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Oil.....	39 75
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Packing.....	253 39
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Office materials.....	62 33
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Tools and repairing of.....	959 99
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Lead.....	18,591 17
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Attorney.....	150 00
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Oatmeal.....	5 50
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Plugs.....	210 79
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Repairs	649 60
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Brick.....	285 00
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Postage and telegraphing.....	7 30
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Street car tickets.....	35 00
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Freight.....	4 00
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Livery.....	90 00
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Damages, and costs of suits for.....	357 96
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Wagon and harness supplies and repairs.....	77 92
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Feed.....	624 60
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Farrier.....	111 78
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Lead pipe, solder, etc.....	575 31
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\$280,104 78

STOP COCKS ACCOUNT :

Labor.....	\$45 50	
Valves.....	9,307 72	
Boxes and covers.....	8,114 95	
Materials and repairs.....	249 39	
		<hr/> \$12,717 56

METERS ACCOUNT :

Meters and repairs.....	\$6,511 79	
Freight and express	58 42	
Superintendency and labor.....	4,841 49	
Tools and repairing of.....	117 78	
Lumber, lead, etc.....	483 97	
Cartage and street car tickets.....	116 45	
Special castings and fittings.....	271 24	
Office expenses.....	12 00	
		<hr/> \$12,413 14

NEW PUMPING WORKS :

Conduit strainers.....	\$448 18	
Flag.....	16 88	
Signs.....	4 00	
Plank Road tickets.....	5 00	
House repairs and materials for.....	189 76	
Labor new conduit.....	5,895 40	
Materials new conduit.....	1,741 74	
Gates new conduit.....	1,887 25	
Relaying No. 1 inlet pipe.....	2,500 00	
New lengths inlet pipe.....	4,729 40	
Repairs of inlet pipe.....	366 07	
		<hr/> \$17 783 63

REAL ESTATE ACCOUNT :

Insurance, office building.....	\$290 74	
Insurance, reservoir buildings.....	29 50	
Architect, office buildings.....	385 85	
Plumbing.....	749 56	
Tile.....	17 50	
Mason work.....	1,473 15	
New vault.....	410 00	
Iron work.....	940 20	
Carpenter work.....	3,129 47	
Painting.....	1,096 62	
Plastering.....	150 87	
Fixtures.....	82 64	
Repairs to roof.....	66 30	
		<hr/> \$8,822 40

Total constructing expenses.....\$31,841 51

OPERATING EXPENSES.

PUMPING WATER ACCOUNT :

Engineers and firemen.....	\$16,911 08	
Coal.....	5,208 24	
Handling coal.....	813 75	
Natural gas.....	27,862 90	
Polish	28 50	
Repairs and materials for.....	781 83	
Gas attachments.....	580 59	
Pumping out basin.....	793 50	
Electric light plant.....	808 24	
Lubricators.....	264 04	
Supplies—rags, waste, etc.....	265 26	
Supplies—tools, lamps, etc.....	77 20	
Freight and express.....	9 73	
Street car tickets.....	9 50	
Heater.....	12 00	
		\$53,870 30

REPAIRING LEAKS ACCOUNT :

Labor.....	\$4,727 52	
Materials, tools and repairing of.....	233 64	
Street car tickets.....	205 00	
Wagon and harness supplies and repairs.....	296 79	
Feed.....	130 29	
Farrier.....	52 00	
Purchasing horse.....	150 00	
		\$5,795 24

TELEPHONE ACCOUNT :

Rent.....	\$347 66	
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SERVICE COCKS ACCOUNT :

Clerk and labor.....	\$6,826 85	
Materials, tools and repairs of.....	108 76	
Service cocks.....	2,138 80	
Wagon and harness supplies and repairs.....	105 64	
Feed.....	79 43	
Farrier.....	50 00	
		\$8,809 47

PERCENTAGE ACCOUNT :

Labor.....	\$1,456 00	
Feed.....	29 50	
		\$1,485 50

INSPECTION ACCOUNT :

Labor.....	\$3,713 00	
Tools and repairs	14 20	
		\$3,726 20

OFFICE ACCOUNT :

Secretary, assessors and clerks	\$16,669 20	
Printing.....	972 30	
Advertising and subscriptions.....	209 69	
Watchmen and janitor.....	1,192 50	
Supplies—soaps, matches, etc.....	128 75	
Supplies—office stationery.....	272 75	
Livery.....	60 00	
Furniture and fixtures	524 14	
Extra services.....	728 05	
Fuel, natural gas....	347 68	
Light, electric.....	192 89	
Postage.....	98 93	
Attorney.....	459 00	
Expert examiners.....	40 00	
G. A. R. decorations.....	47 50	
G. A. R. plumbing.....	35 30	
Germicide, rent....	36 00	
Counterfeit money.....	5 50	
Horse humane society.....	5 00	
Street cartickets....	21 00	
Pressure gauges.....	101 49	
		<u>\$22,057 17</u>
Total operating expenses.....		<u>\$95,591 54</u>

HURLBUT FUND.

Librarian.....	\$300 00	
Superintendent and labor.....	1,499 95	
Materials, lumber, salt, etc.....	64 19	
Carp plant.....	46 65	
Flowers and pottery.....	53 19	
Tools and repairs of....	57 30	
Fixtures for heating.....	30 47	
Garbage.....	5 40	
		<u>\$2,057 15</u>

INTEREST ACCOUNT.

Interest on bonds.....	<u>\$78,765 00</u>
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RECAPITULATION.

Construction.....	\$331,841 51	
Operation expenses.....	95,591 54	
Hurlbut fund.....	2 057 15	
Interest	78,765 00	
Aggregate expenditures for 1891.....	<u>\$508,255 20</u>	

STATEMENT.

Cash on hand, January 1, 1891.....	\$109,833 10
Receipts for the year.....	492,457 45
	<hr/> \$602,290 55
Expended in 1891.....	\$508,255 20
Cash on hand, January 1, 1892.....	94,035 35
	<hr/> \$602,290 55

To the Honorable the Board of Water Commissioners of the City of Detroit :

GENTLEMEN—Under instructions from the Committee on Ways and Means, we have carefully examined the books and vouchers of the Water Works from January 1 to December 31, 1891, and find them correct.

Cash on hand in office.....	\$4,509 23
Commercial National Bank General Fund.....	64,920 50
Commercial National Bank Sinking Fund.....	24,605 62
TOTAL.....	<hr/> \$94,035 35

Respectfully submitted,

(Signed) DAVID R. PIERCE,
JOHN HOSMER,

Expert Examiners.

The following table is the report of the assessment made in May and June, for the fiscal year commencing July 1, 1891:

The total number of families found in the city was 44,932, or an increase in one year of 2,782, which is an increase in the population of the city of 14,132.

In the column showing "Increase or Decrease," it is shown that the assessments were \$7,877 less than those of 1890, but in the next column it is shown that the assessments upon such places as were taken from the assessment rolls and metered, amounted to \$11,300. And when it is further considered that the Board abated the rate on hose, which on the rolls of 1890 amounted in round numbers to \$20,000, it will be seen that instead of being a loss there is an actual gain of \$23,423.

WATER RATES.

ASSESSMENT FOR THE YEAR 1891-1892.

WARDS.	FAMILIES.			Tenements Vacant	Increase Assessed.	ASSESSMENT.		
	Assessed.	Not Assessed.	Whole Number.			1891-92.	Increase or Decrease.	\$ reduced by use of meters.
1st Dist.—								
Seventh	2,900	19	2,919	10	65	\$18,714	— 267	\$562
Ninth	4,408	47	4,455	18	128	25,808	— 115	337
Total	7,308	66	7,374	28	188	44,522	— 382	899
2d Dist.—								
Third	3,086	18	3,103	56	87	21,778	— 376	924
Fifth	3,496	27	3,523	74	149	21,846	— 773	981
Total	6,582	45	6,627	130	236	43,624	— 1,149	1,855
3d Dist.—								
First	2,343	43	2,386	76	11	32,818	— 2,917	1,532
Second	2,029	18	2,047	70	38	33,698	— 6,580	3,852
Total	4,372	61	4,433	146	49	66,511	— 9,497	5,384
4th Dist.—								
Fourth	2,862	2	2,864	66	149	27,208	— 998	657
Sixth	3,249	7	3,256	67	119	24,221	— 669	550
Total	6,111	9	6,120	133	268	51,429	— 1,667	1,217
5th Dist.—								
Eighth	3,008	7	3,015	30	182	20,357	+ 454	45
Tenth	3,736	10	3,736	23	182	23,860	— 227	44
Total	6,729	17	6,746	53	364	44,217	+ 227	89
6th Dist.—								
Twelfth	2,799	21	2,820	14	300	17,979	+ 691	1,014
Fourteenth	1,843	105	1,948	19	255	11,118	+ 450	501
Sixteenth	1,794	329	2,058	9	460	10,392	+ 2,085	.....
Springwells	25	.....	25	.....	8	390	+ 122	.....
Total	6,361	455	6,816	42	923	39,879	+ 3,298	1,515
7th Dist.—								
Eleventh	3,084	9	3,093	9	161	18,900	+ 426	42
Thirteenth	1,955	5	1,960	8	175	12,178	+ 657	52
Fifteenth	1,451	334	1,785	23	170	9,929	+ 150	247
Total	6,440	348	6,788	40	506	41,007	+ 1,233	341
Aggregate	43,983	999	44,982	566	2,534	\$380,709	— 7,877	11,300

The following table shows the receipts for water rates during the year, arranged in districts, and giving the amounts collected upon each annual assessment.

The next to the last column shows the receipts for meter rates for the months of October, November and December only. The total receipts of meter rates during the year, were \$46,684.08.

Previous to October 1, meter rates were collected by the Assessors and Collectors, each in his own district, and are included in the collected rates as shown.

On the 1st of October, the Board created the office of Meter Clerk, and all the work of collection and the keeping of the records necessary to such work, is now imposed upon that official.

The total receipts are \$1,202.24 more than those of last year, notwithstanding a reduction in our meter rates and the hose abatement above referred to.

This showing is very gratifying, inasmuch as I had estimated that the reduction of the meter rates alone would be sufficient to cause the receipts for 1891 to be about the same as those of 1890.

RECEIPTS FOR WATER RATES, 1891.

YEAR.	FIRST DISTRICT.	SECOND DISTRICT.	THIRD DISTRICT.	FOURTH DISTRICT.	FIFTH DISTRICT.	SIXTH DISTRICT.	SEVENTH DISTRICT.	METERS. OCT. 1 TO JAN. 1.	AGGREGATE.
1885-6	.....	\$4.00	.....	.....	.....	.....	.....	.....	\$4.00
1886-7	.....	.....	.....	\$2.50	.....	.....	.....	.....	2.50
1887-8	\$1.25	.....	\$8.00	5.00	\$1.00	\$2.50	.....	.....	17.75
1888-9	27.50	.....	10.75	17.75	1.00	.....	.....	.....	57.00
1889-90	64.75	21.75	34.75	55.50	79.00	22.25	\$9.15	.....	287.15
1890-91	24,165.38	28,874.88	42,973.93	29,032.92	24,253.36	22,013.09	21,594.76	.....	187,898.33
1891-2	25,526.44	24,320.02	40,923.85	28,315.80	24,019.39	21,634.95	22,595.86	\$13,476.94	200,813.25
Total	\$49,765.32	\$48,220.65	\$83,951.28	\$57,429.47	\$48,353.75	\$43,672.79	\$44,189.77	\$18,476.94	\$389,079.97

Total meter rates received during the year, was \$46,684.08.

The following table shows the whole history of the bonded indebtedness of the Board, in which it is seen that the total amount of bonds issued by the Board, is \$1,850,000, of which \$621,000 have been redeemed, leaving outstanding, \$1,229,000, upon which there is an annual interest of \$76,540.

None of these bonds were issued for the purpose of redeeming outstanding bonds falling due, but were paid from the net earnings of the Works, \$471,000 of them having been paid since the last issue of bonds.

In August, 1893, there will fall due, \$146,000, for which there will be in the sinking fund to assist in their redemption, about \$75,000, leaving but \$71,000 to be taken from the general fund.

WATER WORKS BONDS.

NO. OF ISSUE.	ACT OF	ISSUED.	PAYABLE.	AMOUNT.	RATE OF IN- TEREST.	REDEEMED.	OUT- STANDING.
1st	1853	Aug. 1, 1853	Aug. 1, 1853	\$100,000	7cts.	\$100,000	.....
"	"	"	Aug. 1, 1873	100,000	7 "	100,000	.....
"	"	"	Aug. 1, 1873	50,000	7 "	50,000	.....
2nd	1855	Aug. 1, 1855	Aug. 1, 1890	100,000	7 "	100,000	.....
"	"	June 12, 1855	Aug. 1, 1885	100,000	7 "	100,000	.....
"	"	"	Aug. 1, 1890	50,000	7 "	50,000	.....
3rd	1857	Aug. 1, 1858	Aug. 1, 1898	150,000	7 "	4,000	\$146,000
"	"	Aug. 1, 1867	Aug. 1, 1887	100,000	7 "	100,000	.....
4th	1860	Feb. 1, 1870	Feb. 1, 1900	100,000	7 "	.....	100,000
5th	"	Aug. 1, 1872	Aug. 1, 1902	50,000	7 "	.....	50,000
6th	"	Aug. 1, 1873	Aug. 1, 1903	50,000	7 "	.....	50,000
"	1873	Feb. 1, 1874	Feb. 1, 1904	50,000	7 "	9,000	41,000
7th	1869	Aug. 1, 1874	Aug. 1, 1904	50,000	7 "	6,000	44,000
"	1873	"	"	200,000	7 "	.....	200,000
"	"	June 1, 1875	June 1, 1905	150,000	7 "	1,000	149,000
"	"	June 1, 1876	June 1, 1906	200,000	6 "	1,000	199,000
"	"	Sept. 1, 1890	Sept. 1, 1899	100,000	4 "	.....	100,000
"	"	April 1, 1881	April 1, 1897	100,000	4 "	.....	100,000
"	"	Dec. 1, 1881	Dec. 1, 1896	50,000	4 "	.....	50,000
				\$1,850,000		\$621,000	\$1,229,000

NEW PUMPING WORKS.

The amount expended for the new Works to January 1, 1892, is as follows:

ITEMS.	EXPENDED PREVIOUSLY.	1891.	TOTAL.
Land.....	\$35,000 00	.....	\$35,000 00
Force Mains.....	609,414 77	.....	609,414 77
Inlet Pipes.....	76,675 87	\$7,595 47	84,271 34
Dock, Basin and Canals.....	129,409 12	.....	129,409 12
Conduits and Conduit Wells....	63,738 00	9,973 53	73,710 53
Engine, Boiler and Coal Houses.	160,974 28	189 76	161,164 04
Stand Pipe and Tower.....	30,420 72	.....	30,420 72
Pump Wells.....	54,221 56	.....	54,221 56
Engines.....	265,642 24	.....	265,642 24
Boilers.....	44,248 40	.....	44,248 40
Engineer's House.....	7,773 14	.....	7,773 14
Sewer.....	3,666 25	.....	3,666 25
Grounds.....	48,494 03	2,057 15	50,551 18
Inspection.....	2,977 86	.....	2,977 86
Miscellaneous.....	8,730 95	25 88	8,756 83
	\$1,541,387 19	\$19,840 78	\$1,561,227 97

The rapid growth of the city and its largely increased territory, obliged me to recommend to your honorable body the appointment of one additional Assessor and Collector, which was complied with to take effect in April next. P. J. Becker, so long in a position of trust and responsibility in the Western Union Telegraph Company, was selected by your honorable body, and will no doubt be an efficient and zealous official.

I have redistricted the city so that each Assessor will have two wards, and so arranged them that the assessment districts are, as nearly as possible, alike, as far as the work to be performed, is concerned.

They are arranged as follows :

District No 1—9th and 15th Wards.....	P. J. Becker
“ “ 2—11th and 13th “	H. L. James
“ “ 3—1st and 7th “	A. Goebel, Jr.
“ “ 4—3d and 5th “	Max Greuner
“ “ 5—2d and 6th “	Jno. Robinson
“ “ 6—10th and 14th “	F. Hutaff
“ “ 7—4th and 12th “	A. W. Goodsell
“ “ 8—8th and 16th “	A. T. McLogan

VALUATION OF THE WORKS.

The following is an inventory of the properties of the Board, as invoiced by the several heads of departments.

The valuations placed upon the real estate are those of W. S. Green, executor of the W. B. Wesson estate, whose opinion of real estate values is considered the best to be had.

RECAPITULATION.

Office building and lot.....	\$60,000 00
Three lots part of Orleans street.....	41,250 00
Reservoir grounds and improvements thereon.....	47,200 00
Grounds at the new pumping works	250,000 00
Buildings, docks, basin, conduits, etc.....	752,417 24
Water pipe laid and in use.....	2,862,809 98
Meters placed and in use.....	50,187 49
	<hr/> \$4,063,864 71

TOOLS AND MATERIALS ON HAND.

In office building.....	\$8,550 53
In repair department.....	1,327 80
In meter department.....	2,455 84
At reservoir grounds, pipes, specials, etc.....	20,711 89
At reservoir grounds, horses, trucks, etc.....	3,482 47
Inspector department.....	693 75
At new pumping works.....	27,985 70
	<hr/> \$65,207 98
Aggregate.....	<hr/> \$4,129,072 69

INVENTORY OF THE WORKS.

OFFICE.

Office building and lot.....	\$60,000 00
Counter in office.....	1,041 00
Furniture in Board room.....	583 13
Twelve tables.....	200 00
Six book cases.....	660 00

Three wardrobes.....	\$335 00	
Five desks.....	155 00	
Heating apparatus	1,400 00	
Three atlas maps.....	50 00	
Electric light fixtures.....	55 00	
Two tables.....	15 00	
Partitions.....	800 00	
Railing.....	50 00	
Thirty-three chairs.....	81 50	
Eleven office stools.....	42 00	
Two maps.....	18 00	
Clocks	15 00	
Miscellaneous properties.....	100 00	
Upstairs—		
One cabinet desk.....	30 00	
One small desk.....	10 00	
One upright desk.....	10 00	
Two book cases.....	35 00	
One table.....	10 00	
One cabinet drawing table.....	50 00	
Two drawing tables.....	35 00	
Drawing tools.....	70 00	
Maps and drawing.....	2,500 00	
Safe.....	200 00	
		\$68,550 53

PUMPING WORKS.

Three lots corner of Atwater and Orleans streets.....	\$41,250 00
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REPAIR DEPARTMENT.

Tools and materials.....	\$1,327 80
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METER DEPARTMENT.

Valuation of meters in use.....	\$50,187 49	
Valuation of meters in stock.....	2,030 55	
Valuation of tools.....	281 70	
Valuation of materials.....	148 59	
		\$52,648 33

RESERVOIR.

Grounds including houses.....	\$47,200 00	
Railroad siding.....	637 97	
Eight horses.....	700 00	
Six repair wagons.....	350 00	
Two sleighs.....	120 00	
One heavy truck.....	200 00	
Two light trucks.....	300 00	
Storage platform.....	400 00	
Seven pipe derricks.....	700 00	
Harness covers and blankets.....	74 50	
		\$50,682 47

INSPECTION.

Three buggies.....	\$45 00
Five carts.....	500 00
Five sets harness and covers.....	188 75
Two pair.....	15 00

 \$698 75

NEW PUMPING WORKS.

Grounds.....	\$250,000 00
Inlet pipe.....	86,020 47
Dock, basin, and canal.....	64,825 72
Conduits and wells.....	72,187 06
Engine, boiler, and coal houses.....	127,891 28
Stand pipe and tower.....	29,804 25
Pump wells.....	53,648 58
Engines.....	255,000 00
Boilers.....	35,000 00
Engineer's house and barn.....	6,723 64
Drawbridge and foundation.....	5,316 00
Drinking fountain.....	175 00
Underground improvements.....	16,825 29

 \$1,002,417 24

TOOLS AND MATERIALS ON HAND.

Tools.....	\$1,101 24
Materials (rope, waste, etc.).....	829 70
Materials (gauges, valves, etc.).....	497 50
Materials (iron, lead, etc.).....	1,301 09
Furniture.....	410 00
Wood and coal.....	20,151 08
Horses and vehicles.....	136 00
Hoisting engines, gas and electric light plant and supplies.....	3,216 69
Tools and implements (Hurlbut fund).....	342 40

 \$27,985 70

IRON PIPE IN GROUND.

103 feet of 45 inch pipe.....	\$1,699 50
44,909 feet of 42 inch pipe.....	612,177 14
715 feet of 36 inch pipe.....	6,403 55
49,337 feet of 30 inch pipe.....	323,886 40
73,278 feet of 24 inch pipe.....	371,321 08
416 feet of 20 inch pipe.....	1,751 80
87 feet of 18 inch pipe.....	278 40
36,101 feet of 16 inch pipe.....	77,992 60
3,537 feet of 12 inch pipe.....	7,547 25
96,423 feet of 10 inch pipe.....	144,868 47
190,715 feet of 8 inch pipe.....	211,875 30

718,674 feet of 6 inch pipe.....	\$561,480 91
795,482 feet of 4 inch pipe.....	508,781 08
83,767 feet of 3 inch pipe.....	87,637 50
2,686 feet of 2 inch pipe	659 00
	<hr/> \$2,862,809 98

IN STOCK.

Iron pipe.....	\$14,356 85
Sleeves.....	411 65
Bolted sleeves.....	282 37
Hub bolted sleeves.....	607 23
Tees.....	1,249 80
Crosses.....	1,071 63
Bends.....	140 07
Bolted heads.....	65 20
Hub capes.....	79 10
Caps.....	105 87
Curves.....	285 68
Reducers	197 80
Gates.....	905 50
Gate boxes.....	360 00
Coal.....	16 35
Lead.....	663 10
Packing.....	62 20
Relief valves.....	126 00
	<hr/> \$20,711 80
Aggregate.....	<hr/> \$4,129,073 60

In conclusion, I desire to express my appreciation of the courtesies that have been extended to us by the Fire Commissioners, the Board of Public Works and the Park Board and their several employees.

We are all striving to work harmoniously, and for the common good of the city; and during the past year, at least, I am confident that this disposition of the several Boards has been productive of much good.

All of which is respectfully submitted.

L. N. CASE.

Secretary.

**REPORT OF SUPERINTENDENT OF METERS
AND INSPECTION.**

Report of the Superintendent of Meters and Inspection.

DETROIT, January 2, 1892.

To the Board of Water Commissioners:

GENTLEMEN—In compliance with the rules of your honorable body, I herewith report the work done in the meter and inspection departments during the year 1891.

The following tables show the number of meters placed during the year, and the total number in service on the 31st day of December, 1891:

	SIZES.							Total
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{8}$ in.	2 in.	3 in.	4 in.	
Total number of meters placed during the year 1891	190	82	100	26	24	10	8	440

Meters removed during the year, and for what purpose:

	SIZES.							Total
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{8}$ in.	2 in.	3 in.	4 in.	
Not in use	17	3	8	.....	3	1	.....	22
For repairs	4	1	4	1	2	.....	.....	12
Too small for required supply	2	1	3	1	1	1	.....	9
Too large for required supply .....	.....	.....	.....	.....	.....	.....	2	2
Received on approval and returned to owners	8	2	2	.....	.....	.....	.....	12
Total number removed	31	7	17	2	6	2	2	67

SIZES.

	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	1 $\frac{1}{4}$ in.	2 in.	3 in.	4 in.	6 in.	Total
Meters in service Jan. 1, 1891.	298	100	281	45	77	30	14	2	836
Meters placed during the year and in service Jan. 1, 1892.	159	75	83	24	18	8	6	.....	373
Total number of meters in service Jan. 1, 1892.	457	175	364	69	95	47	20	2	1,209

The following tables show the kind and sizes of meters placed during the year 1891, also those removed:

Placed.

SIZES.

KIND.	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	1 $\frac{1}{4}$ in.	2 in.	3 in.	4 in.	6 in.	Total
Thomson	170	80	88	22	18	6	3	.....	387
Crown	5	1	4	1	2	1	.....	.....	14
Hersey .....	.....	.....	5	1	.....	.....	4	.....	10
Worthington	1	1	.....	.....	4	2	1	.....	9
Union Rotary	8	.....	2	2	.....	1	.....	.....	13
Nash	6	.....	.....	.....	.....	.....	.....	.....	6
Duplex .....	.....	.....	1	.....	.....	.....	.....	.....	1
Total placed during 1891	190	82	100	26	24	10	8	.....	440

Removed.

SIZES.

KIND.	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	1 $\frac{1}{4}$ in.	2 in.	3 in.	4 in.	6 in.	Total
Thomson	15	3	6	2	3	.....	.....	.....	29
Crown	5	2	5	.....	1	2	.....	.....	15
Hersey .....	.....	.....	2	.....	.....	.....	2	.....	4
Worthington	1	.....	.....	.....	2	.....	.....	.....	3
Union Rotary	2	.....	1	.....	.....	.....	.....	.....	3
Nash	6	.....	.....	.....	.....	.....	.....	.....	6
Duplex .....	.....	.....	1	.....	.....	.....	.....	.....	1
Niagara	2	2	2	.....	.....	.....	.....	.....	6
Total number removed in 1891	31	7	17	2	6	2	2	.....	67

The following table shows the total number of meters in service and the different kinds and sizes, also indicators attached to hydraulic elevators:

KIND.	SIZES.									Total
	Indi- cat'rs	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{8}$ in.	2 in.	3 in.	4 in.	6 in.	
Thomson.....	383	151	229	48	51	26	4	2		894
Crown.....	45	17	51	12	13	7	4			140
Hersey.....	4	5	52	3	18	2	8			87
Worthington.....	15	2	22	4	16	10	3			72
Union Rotary.....	10		6	2	2	2	1			23
Duplex.....			2							2
Equitable.....			1							1
Ball & Fitts.....			1							1
Indicators.....	10									10
Total in service Jan. 1, 1892.....	10	457	175	364	69	95	47	20	2	1,289

Meters in stock January 1, 1892:

KIND.	SIZES.							
	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{8}$ in.	2 in.	3 in.	4 in.	Total
Thomson	11	3	9	2	4	4	1	34
Crown	7	1	2			2		12
Worthington ..	2	2			1			5
Union Rotary	2		1					3
Total number in stock	24	6	12	2	5	6	1	54

Valuation of meters in stock, January 1st, 1892.....	\$1,605 26
Valuation of material in stock, January 1st, 1892.....	143 59
Valuation of tools in stock, January 1st, 1892.....	281 70
Total.....	\$2,030 55

Valuation of meters in service, January 1st, 1891.....	\$39,690 31
Deduct 10 per cent for depreciation in value.....	3,969 03
Present valuation of meters in service, January 1st, 1891.....	\$35,721 28
Add amount expended during the year for meters placed.....	14,466 21
Total valuation of meters in service, January 1st, 1892.....	\$50,187 49

Cost of material used in repairing meters during 1891.....	\$10 24
Cost of labor in repairing meters during 1891.....	132 50
Total.....	\$142 74

As you will see by the foregoing tables, we have placed 373 meters during the last year. Adding thereto, 856 meters and 10 indicators previously placed, makes a total of 1239 meters and indicators in service on the 1st day of January, 1892.

There have not been as many meters placed during the last year as in the previous year, but in proportion to the number placed, the same gratifying results have been produced as formerly.

After metering the livery stables, laundries, breweries, saloons and manufacturing establishments, we were under the impression that we had stopped the largest source of waste, but such has proven not to be the case. It seems to make no difference where we go, the same careless waste of water confronts us. Latterly we have been metering the principal stores in the central part of the city, and in a majority of them, the waste is very large, principally in the closets and urinals where the disposition seems to be never to shut them off, and in a great many cases they could not be shut even though the occupant was disposed to do so, as the plumbing is so defective.

Another source of great waste is in the tank elevators. Instead of the water being used over and over, as is supposed, through neglect, the automatic valves have become useless, thereby allowing a continuous flow of water, as there are no means of knowing when the tanks are full, the overflow passing directly into the sewer. In several instances, we have found them using 20,000 cubic feet per month, where it was supposed not 20 feet was being consumed.

It is surprising to find the great difference in the consumption of water by those in the same line of business. For instance, one drug store consumed 500 cubic feet in one month, while another of about the same size consumed 28,000 cubic feet. The first was formerly assessed at \$15.00 per year, and the latter \$20.00. Again, a block of offices formerly assessed at \$182.00, consumed during the last year, 554,000 cubic feet, for which they paid \$147.00, while another block somewhat smaller and with the same class of tenants on which the assessment was \$150.00, consumed 1,104,000 cubic feet, for which they paid \$285.00, show-

ing a great waste in the latter, of which the owner was notified on several occasions. He finally concluded it was worth while to investigate the plumbing, and, if necessary, repair it. In doing so he has reduced the consumption from about 100,000 cubic feet to 23,000 cubic feet per month, and is now wondering why he did not give it attention before.

A merchant, who is a great advocate of the meter system, and whose assessment was \$36.00 per year, wanted his premises metered. He was very careful of the water, allowing no waste whatever, and expected to save money by being metered. The first month's consumption was 38,000 cubic feet, cost, \$10.42; second month, 13,800 cubic feet, cost, \$4.20; third month, 7,400 cubic feet, cost, \$2.60; and he expects to reduce it still more the present month, all of which goes to show how little attention is paid to the waste of water until a meter is placed on the premises.

There are very few who object to being metered. Occasionally a strong protest is made, and when it is we suspect bad plumbing the cause, and the meter proves us right in almost every instance. About the strongest protest against the meter came from an unexpected source, the leading spirit in one of our gas companies. He would not allow a meter to be placed on his premises, claiming that the use of water was so small that it would be a useless expense, as the only use was for drinking purposes and closets. No steam for elevator or heating. However, we placed a meter in the ground outside of the premises—as he would not allow us to go inside—and the first month showed a consumption of 33,500 cubic feet, cost, \$9.14; and on presenting the bill were surprised to see what little faith he had in the accuracy of the meter. He was positive it was wrong, but decided to let it go for another month before fully condemning it. The second month showed a consumption of 40,400 cubic feet, cost, \$10.85, and when he saw the bill, there was no question in his mind of the worthlessness of the meter, claiming that he had self-closing faucets on all openings, and there was absolutely no waste, and he wanted the meter removed. He almost convinced us that the meter was at fault, but it seemed to be working all right, and reading it daily

showed that about 1,200 cubic feet were going somewhere, and on making a thorough examination of the premises, found all fixtures in good condition with the exception of some old style pan-closets which had been overlooked in making their repairs, and where the whole trouble lay. After having them changed to tank closets, the consumption has been reduced from 40,400 cubic feet to 3,200 cubic feet, the cost of which is \$1.55. The meter has not been changed, but remains there fully vindicated as to its truthfulness.

After such instances as the foregoing (and there are many of them), one would think there ought not to be any objection to the meter, for it simply records the amount consumed and for which the consumer should pay.

INSPECTION.

The system of making a house to house inspection twice each year has been rigidly kept up, and in doing so, have found it necessary to employ five examiners, who have in addition to their regular duties, read the meters and delivered the meter bills each month, which has taken about one-quarter of their time.

They have made 71,919 examinations. It requires two, and sometimes three calls to each house where a leak is discovered. The occupant is given a stated time to have it repaired, a second call is made and in some cases (where the owner or occupant is in poor circumstances) more time is given, requiring a third call to see if the necessary repairs have been made. After the expiration of the time given, if the notice has not been complied with, the water is shut off.

There have been 3,436 leaks reported, of which 3,115 were repaired and 321 ordered shut off until such repairs were made. A large proportion of the leaks were small, caused by the packing in the bob being worn out, a defect which is very easily and promptly repaired. In some instances the water is found running full head with evidence of it being wasted, at the same time the occupant claiming it to be accidental, and there seems

to be only one way to effectually stop the waste in such cases, and that is the meter. Otherwise as soon as the examiner is out of sight the water is running again, and the same excuse follows, but when a meter is placed on the premises it is surprising to see the effect it has on their memory. They seldom forget to stop the water when not in use.

I am pleased to say there has been a marked improvement in the plumbing during the last year. The plumbers generally have complied with our rules and regulations quite satisfactorily. Some ill feeling was caused by issuing a first and second class license. As I said to you in my communication of December 30, recommending the abolishment of the system, it was next to impossible to draw the line between a first and second class plumber. None would admit of their being second class workmen, and in nearly every case wanted a first class license. They claimed—and I think justly—that, as we had rules and regulations governing them, and also Inspectors to examine their work, if it was not done in a satisfactory manner they were compelled to change it, and after doing so the Water Board ought not to ask anything more. The very fact of them having to change their work, if not properly done, makes them very careful indeed, as to undo a portion or all of their work interferes largely with their profits, and of course, a plumber does not like to have anything of that kind occur.

In doing away with the second class and giving all plumbers a license, then holding them to a rigid compliance with our rules will be much more satisfactory to the plumbers generally and we will arrive at as good results as formerly. The foregoing change does away with the necessity of the Examining Board of Plumbers. The fact that they do their work to the satisfaction of the Water Board shows their capability of doing first class work, and as that is the point we have been trying to arrive at nothing further can be gained, and for that reason I recommended its discontinuance.

The following table shows the work of the Examiners in the eastern and western divisions:

	EXAMINATIONS.	LEAKS REPORTED.	LEAKS REPAIRED.	ORDERED SHUT OFF.
East Woodward Ave.	86,040	1,753	1,640	113
West " "	85,989	1,688	1,475	208
TOTAL	71,979	8,486	8,115	321

The following table shows the duties performed by the Inspectors of new work:

	Calls for Non-payment.	Shut for Non-payment.	Examined New Connections.	Examined Extern's and Fixtures.	Let on New Connections	Notified for Building Tax.	Shut for Vacancy.
John Wallace.....	406	181	710	174	663	50	120
John Hatsenbuehler.....	759	425	865	73	789	41	89
Michael Hart.....	876	670	649	135	670	75	80
John Becker.....	992	422	300	236	229	125	79
C. J. Paterson.....	518	439	687	157	480	97	113
TOTAL.....	3,550	2,137	3,301	777	2,611	388	421

Attached to this report is a complete list of tools on hand, and an itemized account of the material in stock on the 31st day of December, 1891.

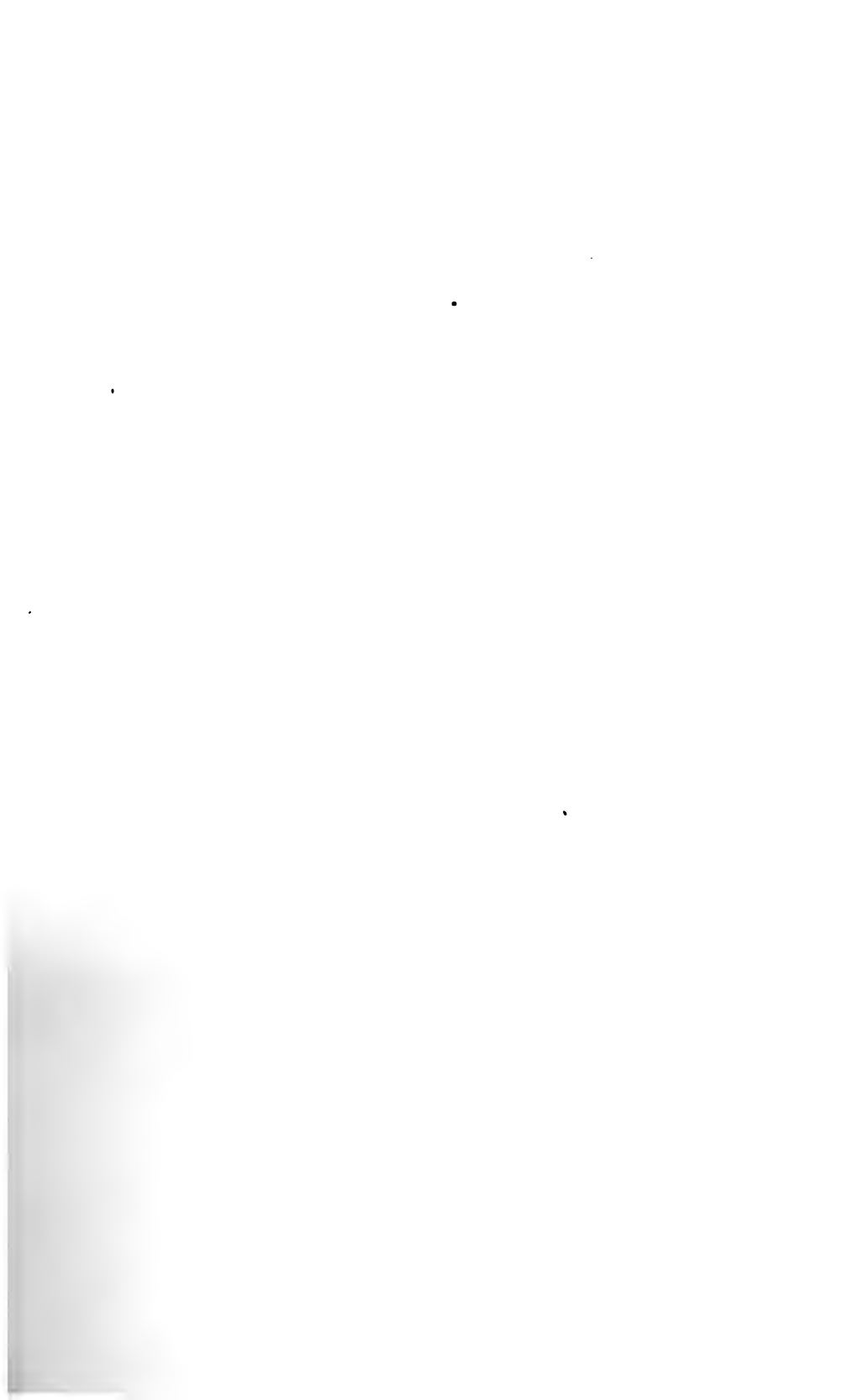
Before closing this report I want to thank the Board for their uniform kindness in the past, and also the Secretary for his very courteous treatment at all times. When any complications have arisen I have consulted him, and owing to his good judgment and convincing arguments, together with the active interest taken in the meter system, we have moved along with the least possible friction in our department.

All of which is respectfully submitted.

T. R. PUTNAM,

Superintendent of Meters and Inspection.

REPORT OF SUPERINTENDENT OF GROUNDS.



Report of Superintendent of Grounds.

To the Honorable Board of Water Commissioners :

GENTLEMEN—In accordance with the regulations of the Board I respectfully submit to your honorable body my report of the work performed upon the grounds at the pumping works, together with such recommendations in regard to future operations as seem to me wise for the coming year.

The work performed has of course been almost entirely of a routine nature, as it has been the wish of the Board, on account of the unsettled condition of the Hurlbut legacy, to keep the grounds from deteriorating rather than to make any general improvements.

The strip along the east line fence south of the engine house, through which the new inlet was laid in 1890, has settled firmly, and we have leveled it to the proper grade and sown grass seed, and expect a fine greensward by June 1st.

About one acre in the northeast corner of the grounds became badly covered with quack grass and weeds, although careful and continual attention was given to prevent such growth.

The only remedy left was to plough the piece, harrow well, and sow grass seed, which was done.

Along the west side of the canal is a strip that is so covered with thistles and weeds that I would advise ploughing it in the spring, and sowing oats and seeding clover, as oats are of value to the Board. With the permission of your honorable body I will carry out this plan upon the opening of spring.

Acting under instruction from your Committee on Pumping Works, about the middle of July I worked out the floral design, "Welcome G. A. R., 1891," in the plat of grass near the engine house. Owing to continual cool weather the plants were

not at their best during G. A. R. week, but were, I think, equal to anything of the kind in the city.

We have utilized the engine house gallery to keep the plants through the winter, but I am sorry to say that they are not doing very well, although a steam pipe has been laid, and the temperature thereby preserved in an equable condition. There seems to be other reasons why the plants do not do well, one is I think the atmosphere is too dry, and another that there is not sufficient light; however, I hope to save most of them, as it is my intention to make a few flower beds in the spring, but of course we can not expect very satisfactory results until we have a proper green-house.

I have been instructed by your committee to inquire as to the probable cost, method of heating, etc., of a green-house, suitable for our present use; and I would respectfully report that I have inspected several green-houses in the city, and am of the opinion that three hundred and fifty dollars would cover cost, aside from facilities for heating, which would cost about one hundred and fifty dollars for piping, if you should conclude to use live steam from our boilers.

In giving the estimate of the cost of a green-house I have done so under the idea that I may control the construction of the same, after the plan thereof has been approved by the Board, and that I be permitted to purchase the material therefor, and have the same erected by days' labor.

Last year I recommended placing a new iron fence along the Jefferson avenue front, also laying sewer crock, and filling in the road ditch. These improvements would add very much to the general appearance, and I hope your honorable Board will deem it expedient to have these improvements made during the ensuing year.

In conclusion, there is a matter that is giving me considerable uneasiness, and that is the contemplated widening of Jefferson avenue, and the evident prevailing idea that the said additional width be taken from the property upon the south side of the

avenue. Should this idea be adopted the results to the grounds would

be very unfortunate, as the row of maples immediately along the Jefferson Avenue line, which were originally set out to conform with a general plan of ornamentation, and which are now about twenty years old and in a very flourishing condition, would have to be cut down or removed back farther at a considerable expense, and probably a loss of some of the trees. I have thought it best to call the attention of the Board to this, what appears to me, a very grave matter, in order that they may be fully apprised of such contemplated action, and oppose the same should they deem it wise to do so.

Accompanying this is a report of expenditures and inventory of tools and material on hand in this department.

Respectfully submitted.

E. A. SCRIBNER,
Superintendent of Grounds.



**REPORT OF THE CHIEF ENGINEER AT
PUMPING WORKS.**



Report of Chief Engineer at Pumping Works.

DETROIT, January 1, 1892.

To the Board of Water Commissioners:

GENTLEMEN—I have the honor to submit the Engineer's report for the year 1891.

The following table shows the number of gallons of water pumped, and cost of fuel for the years named:

YEAR.	GALLONS OF WATER PUMPED.	COST OF FUEL CONSUMED.	AVERAGE DAILY DELIVERED.
1852.....	235,840,271		646,411
1853.....	303,531,743	\$2,129 37	931,594
1854.....	376,265,126	2,271 34	1,030 866
1855.....	542,807,364	3,325 81	1,487,143
1856.....	692,124,305	4,017 44	1,896,231
1857.....	697,190,523	3,993 20	1,909,837
1858.....	718,091,207	3,655 20	1,967,373
1859.....	782,112,587	3,194 15	2,142,774
1860.....	870,036,451	4,196 21	2,388,580
1861.....	895,129,423	4,414 07	2,452,409
1862.....	994,945,329	3,150 95	2,725,878
1863.....	1,035,798,043	4,670 86	2,837,803
1864.....	1,018,390,256	7,647 62	2,839,078
1865.....	1,049,514,887	7,372 89	2,875,383
1866.....	1,196,317,922	9,349 16	3,277,583
1867.....	1,425,535,230	10,121 82	3,905,576
1868.....	1,666,545,125	11,379 23	4,507,248
1869.....	1,946,810,325	11,247 92	4,511,809
1870.....	1,866,060,068	12,713 78	5,112,493
1871.....	2,300,150,605	14,681 05	6,301,782
1872.....	2,782,292,578	17,736 86	7,601,892
1873.....	3,198,393,948	20,233 30	8,782,723
1874.....	3,289,872,635	20,431 71	9,013,350
1875.....	4,207,454,260	21,393 98	11,527,272
1876.....	4,065,134,470	19,832 89	11,107,499
1877.....	4,213,239,790	17,433 72	11,543,123
1878.....	4,345,743,330	10,943 82	11,906,146
1879.....	5,129,599,110	11,219 51	14,053,696
1880.....	5,552,965,310	12,276 60	15,172,036
1881.....	6,543,127,968	16,556 63	17,926,377
1882.....	6,284,000,742	13,156 16	17,261,440
1883.....	7,379,327,188	16,495 99	20,217,334
1884.....	8,510,614,140	19,877 07	23,253,044
1885.....	9,970,829,580	21,341 48	27,317,341
1886.....	10,576,571,254	20,387 24	28,976,907
1887.....	13,168,859,808	35,882 83	36,079,166
1888.....	14,380,166,670	39,568 66	39,397,716
1889.....	12,875,334,453	34,413 31	35,274,883
1890.....	12,120,944,532	31,852 40	33,208,067
1891.....	12,057,261,236	33,826 86	33,033,592

Report of Chief Engineer at Pumping Works.

DETROIT, January 1, 1892.

To the Board of Water Commissioners:

GENTLEMEN—I have the honor to submit the Engineer's report for the year 1891.

The following table shows the number of gallons of water pumped, and cost of fuel for the years named:

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1854.....	376,265,126	2,271 34	1,030 866
1855.....	542,807,864	3,325 81	1,487,143
1856.....	692,124,805	4,017 44	1,896,231
1857.....	697,190,523	3,993 20	1,909,837
1858.....	718,091,207	3,655 20	1,967,373
1859.....	782,112,587	3,194 15	2,142,774
1860.....	870,036,451	4,196 21	2,383,580
1861.....	895,129,423	4,414 07	2,452,409
1862.....	994,945,329	3,150 95	2,725,878
1863.....	1,035,798,043	4,670 86	2,837,803
1864.....	1,018,390,256	7,647 62	2,839,078
1865.....	1,049,514,887	7,372 89	2,875,383
1866.....	1,196,317,922	9,349 16	3,277,583
1867.....	1,425,535,230	10,121 82	3,905,576
1868.....	1,666,545,125	11,379 23	4,507,248
1869.....	1,946,810,325	11,247 92	4,511,809
1870.....	1,866,060,068	12,713 78	5,112,493
1871.....	2,300,150,605	14,681 05	6,301,782
1872.....	2,782,292,578	17,736 86	7,601,892
1873.....	3,198,393,948	20,233 30	8,762,723
1874.....	3,289,872,635	20,431 71	9,013,350
1875.....	4,207,454,260	21,393 98	11,527,272
1876.....	4,065,134,470	19,832 89	11,107,499
1877.....	4,213,239,790	17,433 72	11,543,123
1878.....	4,345,743,330	10,943 82	11,906,146
1879.....	5,129,599,110	11,219 51	14,053,696
1880.....	5,552,965,310	12,276 60	15,172,036
1881.....	6,543,127,968	16,556 63	17,926,377
1882.....	6,284,000,742	13,156 16	17,261,440
1883.....	7,379,327,188	16,495 99	20,217,334
1884.....	8,510,614,140	19,877 07	23,253,044
1885.....	9,970,829,580	21,341 48	27,317,341
1886.....	10,576,571,254	20,387 24	28,976,907
1887.....	13,168,859,808	35,882 83	36,079,166
1888.....	14,380,166,670	39,568 66	39,397,716
1889.....	12,875,334,453	34,413 31	35,274,883
1890.....	12,120,944,532	31,852 40	33,208,067
1891.....	12,057,261,236	33,826 86	33,033,592

The following tables show in detail the work done by each engine during each month of the year.

ENGINE NO. 1.

MONTHS.	Time run.		Revolutions.	Gallons.	Cost of Kindling.	Pounds of Coal.	Cost of Coal.	Cost of Nat. Gas.	Total Cost.	Duty.	No. gals. with 1 lb. coal.
	M.	H.									
January	743	40	306,747	307,082.178	\$3 00	41,025	\$ 87 17	\$719 74	\$802 91	77,919.234	812
February	672		324,618	274,197.532	3 75	60,681	128 84	616 58	749 17	74,676.106	778
March	744		377,482	292,177.068	3 75	80,505	171 07	659 00	833 68	71,416.510	744
April	720		363,441	361,305.354	3 75	85,799	178 07	658 17	774 90	73,978.071	771
May	192		93,512	72,378.298	1 87			196 11	197 94	74,514.739	776
June	504		211,962	374,603.016	6 62	6,648	14 14	1,028 36	1,038 02	73,530.961	767
July	744		347,620	538,115.710	3 75	125,802	236 95	1,106 88	1,499 58	73,136.091	762
August	430		231,543	358,428.564	2 80	43,900	93 27	895 40	991 17	73,703.636	769
September	216		118,159	182,910.182	5 00	24,522	51 10	456 25	512 35	72,761.950	758
October	367	50	161,583	250,130.344	3 35	126,947	269 76	407 11	679 22	75,057.930	782
November	91	15	26,686	49,395.874	3 12	10,414	22 12	119 97	145 21	60,161.153	720
December	572	10	303,439	224,861.786	2 69	3,814	8 10	682 84	693 53	69,012.256	719
Total	6,016	55	3,028,832	3,215,754.636	\$36 15	636,067	\$1,350 59	\$7,531 31	\$8,918 06		

ENGINE NO. 2.

MONTHS.	Time run.		Revolutions.	Gallons.	Cost of Kindling.	Pounds of Coal.	Cost of Coal.	Cost of Nat. Gas.	Total Cost.	Duty.	No. gals. with 1 lb. coal.
	M.	H.									
January	774		365,390	635,634.712	\$3 00	144,971	\$306 06	\$1,474 28	\$1,785 29	78,759.245	766
February	672		370,160	595,281.732	3 75	141,115	299 80	1,398 98	1,642 54	73,881.060	770
March	744		406,729	654,057.216	3 75	184,501	421 81	1,475 94	1,901 54	70,101.040	731
April	624		357,195	542,200.500		172,350	366 24	1,144 10	1,510 24	73,169.183	733
May	552		295,467	397,555.609	1 87	13,144	57 93	615 59	673 39	71,690.102	716
June	576		308,383	494,012.656	6 62	7,170	15 28	1,105 80	1,131 24	73,600.374	767
July	744		379,053	609,517.234	3 75	174,163	370 09	1,323 13	1,695 97	73,305.236	763
August	489	45	231,967	325,507.596	2 50	43,540	92 52	867 90	982 92	73,718.146	768
September	456		240,406	235,280.944	5 00	31,641	67 28	590 15	631 84	72,544.196	756
October	694	30	307,301	374,984.090	2 35	169,916	468 57	649 00	1,014 92	75,999.136	734
November	264	35	198,090	174,507.266	3 13	26,983	78 54	413 05	507 25	70,084.743	730
December	744		434,480	699,650.920	7 00	11,362	24 21	2,036 84	2,068 05	66,833.742	719
Total	7,225	50	3,090,191	5,318,141.400	\$36 71	1,161,576	\$2,475 28	\$13,056 29	\$15,568 23		

ENGINE NO. 3.

MONTHS.	Time run.		Revolutions.	Gallons.	Cost of Kindling.	Pounds of Coal.	Cost of Coal.	Cost of Nat. Gas.	Total Cost.	Duty.	No. gals. with 1 lb. coal.
	H.	M.									
January.....											
February.....											
March.....	396		51,587	93,306,600	\$3 75	29 705	\$63 23	\$196 32	\$263 29	73,281,030	764
April.....	744		391,379	704,302,200	1 87	39,044	83 90	1,917 50	2,002 83	71,692,056	749
May.....	860		176,841	318,313,600	68	5,660	12 02	870 05	883 70	73,414,617	765
June.....											
July.....											
August.....	553		277,471	499,447,800	2 50	61,182	130 01	1,247 99	1,380 50	73,740,996	768
September.....	696		368,796	663,734,800	5 00	89,351	169 73	1,662 10	1,856 82	69,560,467	725
October.....	432		225,204	405,367,200	2 35	305,154	437 01	659 49	1,096 85	73,236,000	753
November.....	648		354,946	638,902,800	3 13	135,736	266 43	1,564 53	1,866 09	70,156,126	731
December.....											
Total.....	3,228		1,846,314	3,323,365,300	\$19 23	566,303	\$1,303 27	\$3,117 98	\$9,340 48		
Aggregate.....	17,173	45	8,802,347	12,067,961,286	\$93 09	2,387,245	\$5,029 19	\$28,705 58	\$33,836 86		
Fuel consumed.....											\$33,836 86
Salaries, engineers and firemen.....											16,911 03
Polish.....											28 50
Repairs and material for repairs.....											761 88
For gas attachments.....											130 59
For electric light.....											308 24
Lubricators.....											361 04
Packing, rags, waste, etc.....											205 26
Tools, lamps, etc.....											77 30
Freight and express.....											9 73
Street car tickets.....											9 50
											\$3,012 77

Cost per million gallons, \$4.39- $\frac{1}{2}$.

Engines One and Two were run part of time with only one pump attached.

In figuring the duty in foot pounds, I have taken the total cost for fuel and reduced the same to coal, at \$4.25 per ton.

By referring to the tables you will notice the daily average is 33,033,592 gallons, which is less than the average last year. This showing is remarkable considering the number of miles of new mains laid in the annexed territory, supplying 3,301 additional consumers. It is very evident that as the meter system is extended, the waste of water becomes less, and is proving a great benefit to the city, not only in reducing the expense of additional pumping facilities and water mains, but is making it possible to furnish a better head of water. This alone ought to satisfy the citizens of the wisdom of adopting the meter system.

I doubt that the present low water rate would have met our running expenses, if the meter system had not been adopted. You will notice our cost for fuel is more than in 1890; this may be accounted for by the better head furnished. The water in the river has been lower than ever before, and we have raised it a greater height than any year since I have been connected with the Water Works. Every additional inch the water is elevated adds to the cost.

I am glad to report that the engines are in good order, although hardly any repairs to either of them have been made the past year. You will see the duty shows rather lower than former years. The reason of this is the numerous changes from coal to gas, and *vice versa*. A great many times the pressure on the gas gauge would show very little gas, and for fear of complete failure, and for safety, we would start fires in the four coal boilers. By the time the coal boilers began to make steam the gas would come to usual pressure and of course the coal would be consumed making a great waste of fuel, which counts against the duty of the engines.

The four boilers in the west boiler room have been in almost constant use for nearly fifteen years and of course the plates are somewhat weaker although as soon as any defect shows I have had the same repaired immediately in the best possible manner. The boilers in the east boiler room have been in use

about ten years, and have had some repairs and are now in very fair order. When it becomes necessary to have new boilers I would suggest bushing the high steam cylinders in the three engines so that we could carry about 125 or 130 pounds pressure; we would get greater benefit from expansion, as the expense of evaporating 130 pounds of steam does not cost in the same ratio as the first fifty or sixty pounds.

I do not hesitate to say, with higher steam and the engines bushed as I have suggested, they would do a duty of 100,000,000 foot pounds. As to the wisdom of this proposed change, I would respectfully refer to Commissioner Kirby as he will readily understand these points. Of course none of these suggestions could be carried out until a new engine was erected, and I now urge, as I have heretofore, the necessity for another engine, as I am satisfied during next summer we will need to run all three engines to supply the demand for at least four hours daily while there are thousands of hose running full head. The demand for water is so very irregular; through the day we may be pumping at the rate of thirty-five million up to about four o'clock; from then until 8.30 we would be pumping at the rate of fifty to sixty millions; after that time we keep checking down and run as slow as possible. So you can see that as we have boilers enough through the day we have more than enough through the night. Although the boilers may be banked or the fire checked down, the fuel is being consumed without the engines getting any credit for duty.

You will bear in mind that the reserve engine serves as a reservoir, but if while we are depending so much on this engine, one of the engines should become disabled, which may happen any time, you can readily see the city would be with a short supply, and I do not think it wise to take this risk. The past year has been a very favorable one for the Pumping Works, as hardly a week passed without a shower of rain. If the time for the use of hose was limited to morning and evening, it would be a great advantage to us and the citizens would not be inconvenienced. This rule is in force in other cities and why not in Detroit?

I have lately visited all the large manufacturers in the city that are using crude oil for fuel, and I find it to be a very satisfactory fuel, all users speaking in the highest terms of it. With good combustion the heat is distributed very evenly on the boilers, and I venture to say 30 to 40 per cent. cheaper than coal or natural gas, and I would recommend having the necessary fixtures put into the four boilers in the east boiler room.

I can see no economy in gas over coal, and experience teaches us that we run a great risk of short supply, as has happened several times during the year, as I have before mentioned. It is a very clean fuel and easy to control, but I can not recommend its continual use.

I am thankful to the Board for having adopted new rules governing the employees, and especially that of having three assistants, either of whom have full charge during my absence. These assistants have eight hour watches and are held responsible, and as I have every confidence in them, I am relieved of considerable anxiety and care.

I am also glad to report that the employees are faithful in the performance of their duties, and the orders of the Board are obeyed to the very letter. The utmost satisfaction prevails throughout this department.

Respectfully submitted.

JOHN E. EDWARDS,

Engineer.

**REPORT OF THE SUPERINTENDENT OF
EXTENSION AND CONSTRUCTION.**



Report of the Superintendent of Extension and Construction.

DETROIT, January 2d, 1892.

To the Board of Water Commissioners:

GENTLEMEN—In accordance with the regulations of your Honorable Body, I have the honor to present my annual report relative to the general condition and progress of the work in this department.

This has been another year of very large extensions to our pipeage system, one of the largest on record, over 43 miles of pipe having been laid.

At the commencement of the year we had anticipated but a small outlay for this part of the work, and, had it not been for the taking in of so much new territory, and annexing it to our city, the outlay for extensions would have been comparatively light. But in view of the fact that such annexations have been made it became evident that a larger provision of pipeage would of necessity have to be made to meet the anticipated numerous calls upon your Honorable Body for extensions in this line of the work. So in consideration of this fact, I was instructed to make such estimates of our needs as in my judgment would be required to meet the present, and in some degree, the future needs of these annexations.

As a result of such estimate it became necessary to increase our order for pipe about 200 per cent. Though much of this has been laid in the new territory, the greater amount of the large pipe was laid within the old line of the city, from which we expect to derive a dual purpose therefrom of an abundant supply for all the newly annexed territory and all of the high

grounds south of the old line of the northerly section of our city. The pressure in this section having been greatly diminished by the increasing demands upon the previously laid mains and a lack of a more bountiful supply.

To meet the needs as above stated a 30-inch line of main was laid in Collins Street from Canfield Avenue to Griffin Avenue, and, from which, and connecting thereto, a line of 24-inch main was also laid through Griffin Avenue and the North Boulevard, from Collins Street to about 450 feet west of Sullivan Avenue, and from this line of 24-inch, a 16-inch main was laid in Woodward Avenue, from the North Boulevard to the intersection of Wilkins and Woodland Avenues, and to which all cross connections have been made where streets have been opened.

About 20 miles of distribution pipes and mains have been laid in this new territory, ranging in size from 4 to 16 inches.

The object of taking the North Boulevard for this northerly supply main, was, because this is the only direct unobstructed thoroughfare through which such a line of main could be laid. To have laid in any other street or avenue save this one, and in this district, would have caused the placing of a number of very objectionable angles and bends, and also added to the length and cost of laying the same, as well as greatly diminishing the flow by the added friction. And, it is doubtful whether we could have got through to the point we desired in any other way, from the way the streets are laid out in this section of the city. It is only necessary to give a casual glance at the city's map to be convinced of this fact. It may be well to add that special care was taken in laying the mains through this section of the Boulevard, every foot of earth filling having been thoroughly pounded in where the mains have been laid in the roadway, and to meet the needs of the resident property, branches were set on both sides of the Boulevard with pipe connections, the intention being to lay a line of pipe just outside the fence line, to avoid contact with the road beds and the lawns; this being the original plan of the early Park and Boulevard Commissioners. A line is already laid on the south side of the North Boulevard from Woodward Avenue to a few

feet west of Russell, and a number of shorter sections west of Woodward Avenue.

Considerable improvements are still being made as circumstances demand in the older portions of the city, by the replacing of some of the smaller lines of pipe with pipe of larger size, and the laying of pipe in some of the streets where pipe have not as yet been laid. The object being to meet the many changes that are constantly going on in some of these localities, calling for a greater supply of water.

The following are some of the streets and avenues in which improvements have been made in our pipeage: Miami Avenue, from Gratiot Avenue to Witherell Street, and in Witherell and Park Streets, from Miami to Washington Avenues, 16-inch mains laid; John R. and Clifford Streets, from Miami to Washington Avenues, and in Wilcox Street, from Miami to the west side of Woodward Avenues, 12-inch main laid; Washington Avenue, from Grand River Avenue to Park Street, 10-inch pipe laid; Russell Street, from Catherine to Maple Streets, 8-inch pipe laid, replacing 4-inch pipe.

RECOMMENDATIONS.

We are realizing the need of a more static head and supply of water at the intersection of Rivard, Maple and Gratiot Streets. I have thought it wise to recommend the laying of an additional line of pipe in Rivard Street, from the 24-inch main in Watson Street to Gratiot Avenue, and in Gratiot Avenue, from Rivard Street north to Rivard Street south; this line to be either 10 or 12-inch pipe. The laying of this line will greatly help the smaller pipe in this section. All through this locality, as you are aware, are numerous calls for copious supplies of water.

I find by the Secretary's records of pressure at No. 11's engine house, corner of Gratiot and Grandy Avenues, we have but a very low head, and one which fluctuates greatly at certain hours of the day. This is no doubt owing to the meager supply through the small size of some of the pipe in this sec-

tion. To remedy this I would recommend the laying of an 8-inch pipe in Calhoun Street, from Chene Street to Grandy Avenue, connecting the same with the 30-inch main in Chene Street, and the replacing of a section of 4-inch pipe in Grandy Avenue, from Pierce Street to Gratiot Avenue, with 8-inch pipe.

Watson Street, 24-inch main. When the embankments of the abandoned reservoir in line of Orleans Street are taken down, a much needed improvement can be made in the 24-inch mains in this place, leading to and from the reservoir, by dispensing with a number of very sharp angular connections that are now in these lines, thereby giving a freer outflow to the Watson Street main. I find on examination of this main that it lays diagonally with the street between Riopelle and Russell Streets, and near to Russell Street; this main is partly under the north wall of the sheds of the House of Correction, and at the intersection of Watson and Russell Streets, there is quite an offset in the main which could be remedied by taking up a section and relaying in a proper line with the street. It would be well to do this the coming season.

North Boulevard, 24-inch main. To finish out this line in accordance with our proposed plan, it will require the laying of an additional length of 2,100 feet; this will carry the line west of Grand River Avenue, and beyond the Boulevard.

As we are anticipating the work in the extension department to be light the coming season as compared with the previous two years, I would respectfully recommend that the balance of the wood pipe be taken out and replaced with iron pipe. There is now less than nine miles in use; this amount can readily be done the coming season, and will rid us of this log system.

During the early part of last season the final connection of the 36-inch main in St. Aubin Avenue was made with the lower 42-inch main in Congress Street, a section of which was cut out and a 36x42-inch branch inserted. Since connecting these mains we have a more static head, and by this arrangement of the mains we have a dual system of supply for the densely business portion of the city; two relief valves were set in connection with this work.

The new line of 30-inch main laid the past season in Collins Street was connected with the upper 42-inch main, at the junction of Collins Street and Canfield Avenue ; a relief valve was set at this point.

Relief valves—During the past season several relief valves have been placed on some of our larger mains, for the purpose of counteracting as much as possible any water hammer that may be caused by a quick closing of the larger connections along these lines or from any other cause. This valve is one of my own design, simple in its action and construction of the double-seated poppet valve design. The valves proper are flat disks, and as near equal in size as practicable, thereby reducing the weight of the counter balance to a minimum. The seats have brass bushing, the valves are faced with sole leather, the body and disks are of cast-iron, the valve stem of wrought-iron.

The pipes for our extensions were furnished by the Detroit Pipe & Foundry Company; the specials by the Riverside Iron Works, of Detroit.

PIPEAGE.

The amount of distribution pipe and mains laid and relaid, and iron and wood pipe discontinued during the past season, is as follows: Total iron pipe laid and relaid $43\frac{2}{3}\frac{5}{8}\frac{1}{8}$ miles, of which 1,812 feet was relaid, and in addition to this 2,757 feet was laid for private use. This amount is not included in the above mileage. Wood pipe discontinued $1\frac{4}{8}\frac{0}{8}\frac{7}{8}$ miles, and iron pipe 4,803 feet, making the net increase of the pipeage $42\frac{1}{8}\frac{1}{8}\frac{5}{8}$ miles. This amount added to the measured lines of iron and wood pipe connected with the Works, will make the total length $401\frac{5}{8}\frac{3}{8}\frac{0}{8}$ miles, of which $393\frac{3}{8}\frac{1}{8}\frac{3}{8}$ miles are iron and $8\frac{2}{8}\frac{2}{8}\frac{7}{8}$ miles wood pipe, which in detail is as follows:

SIZE OF PIPE IN INCHES.	MEASURED LENGTH IN FEET FOR 1890.	ADDED LENGTH IN FEET, 1891.	DISCONTINUED LENGTH IN FEET, 1891.	TOTAL LENGTH IN FEET FOR 1891.
45	103	.....	.....	103
42	44,909	.....	.....	44,909
36	695	20	.....	715
30	42,326	7,011	.....	49,337
24	55,013	18,265	.....	73,278
20 ⁵	461	.....	.....	461
18	87	.....	.....	87
16	15,962	10,139	.....	26,101
12	1,973	1,554	... ..	3,527
10	89,527	7,896	.....	96,423
8	156,109	34,606	1,546	189,169
6	637,167	76,507	335	713,339
4	724,036	71,396	1,889	793,543
8	84,602	371	1,033	83,904
2	2,636	.....	.....	2,636
TOTAL..	1,854,606	227,765	4,803	2,077,569

TABLE OF PIPEAGE AS ARRANGED BY WARDS.

WARD.	4 In.	6 In.	8 In.	10 In.	12 In.	14 In.	16 In.	18 In.	20 In.	24 In.	30 In.	36 In.	48 In.	6 In.	8 In.	Loos.	LEAD.	TOTALS.
First Ward	71,328	37,364	12,312	26,882	1,092	13,641				6,754	3,934		2,940		5,677	1,877		182,803
Second "	51,877	37,100	5,913	15,738	412	5,153				5,713	4,194				4,142	282		120,903
Third "	41,738	35,285	5,043	5,571		2,134				4,549	2,309		1,579		6,347	6,437		101,063
Fourth "	64,327	37,430	6,333	96		2,264				5,323	3,353				6,597	1,662		127,163
Fifth "	59,642	13,565	6,538	8,911		1,012				3,678	2,513		1,749		3,887	6,521		108,088
Sixth "	54,732	36,825	10,258	3,871		703				5,463	2,533				5,428	281		110,166
Seventh "	43,816	15,045	15,073	3,251	1,027	745			406	11,946	3,083		1,829		2,908	761		104,193
Eighth "	47,061	38,730	20,227	161					4,463	2,153					8,338	7,008	175	128,364
Ninth "	55,075	55,340	6,017	471	946				2,438	12,063	715	3,369			9,915	8,871		153,119
Tenth "	70,711	38,625	18,322	6,971					8,408	2,443					4,323	446		126,214
Eleventh "	53,111	43,775	2,077						1,463				3,473		8,186	9,771		121,864
Twelfth "	28,991	51,605	18,492	3,951	50	188	87		55	2,923	2,593				5,718	446		115,063
Thirteenth "	59,001	30,665	5,842	441					513	7,173			7,519		7,838	991		120,083
Fourteenth "	36,361	67,690	17,032	5,061						10,303	1,018				3,143		160	131,388
Fifteenth "	21,366	63,815		3,821									9,249					96,381
Sixteenth "	19,981	70,420	16,622	10,736											1,448			119,107
Annexed Territory	12,016	34,900	23,997	446									13,687	108	2,636			78,685
Outside of City		5,180																5,180
TOTALS	793,543	713,339	189,169	96,423	3,527	26,101	87	461	73,278	49,387	715	44,900	103	2,631	83,940	44,772	385	2,123,675

During the past year 569 gates have been set, 44 gates reset, and 25 gates taken out. Of the 569 gates set, 170 were blow-off gates, of the 44 gates reset, 41 were blow-off gates, and of the 25 gates taken out, 19 were blow-off gates.

NO. OF EACH KIND.	NAME OF GATES.	DIAMETER IN INCHES.	REMARKS.
1	Michigan B. & I. Works.....	36	Set.
5	Murdock Valve Co.....	30	"
11	" " ".....	24	"
8	" " ".....	16	"
5	" " ".....	12	"
23	" " ".....	10	"
87	" " ".....	8	"
120	" " ".....	6	"
3	Michigan B. & I. Works.....	6	"
280	Murdock Valve Co.....	4	"
9	" " ".....	4	Reset.
8	Michigan B. & I. Works.....	4	Blow off.
5	Flowers Bros.....	4	" "
5	Pittsburgh.....	4	" "
9	Ludlow.....	4	" "
38	Miscellaneous gates.....	4	" "

There are now 3,843 stop gates in use in the mains and distribution pipe, ranging in size from 3 to 42 inches, and in addition to this number we have 552 blow-off gates in size from 3 to 24 inches.

There are now connected with the water mains 1,968 fire hydrants and 439 reservoirs; 140 hydrants and 19 reservoirs were added the past year.

It has occurred to me that some mention should be made as to what extent your honorable body are doing from year to year, specially for the Fire Department, in the way of setting branches, and laying of extra lines and larger mains. We have in the past two years laid about five miles of main, mainly for fire extinguishing purposes, and in the past eight or ten years many additional lines have been laid for this purpose alone. During the past six years not less than 1,200 branches were

set and connected with some of the larger street mains. These in the main aggregate no small amount to the cost of our construction. It may be safely estimated that not less than \$2,500 are spent yearly for this department alone. We do not mention this fact for any other reason than to show to our citizens what the Water Board is doing for this department to provide fire protection to our homes and business interests. It has been my orders, in the fifteen years I have been in the employ of your honorable body, to make suitable provision both for pipe and branches to this end. I am pleased to say, that though the amount of work done by the Water Board for the other departments of the city has been greatly in excess of that returned, it is only courteous to say that the Fire Department has rendered us very valuable service, by the use of their steamers in displacing the water in the mains when making our large connections, and also at such times when serious breaks have occurred in the same.

TABLE OF SERVICE CONNECTIONS,

With iron and wood pipe, of sizes from $\frac{5}{8}$ inch to 6 inches, in detail, as follows:

SIZE OF CONNECTIONS WITH IRON AND WOOD PIPE.	NUMBER REPORTED IN 1890.	NUMBER ADDED IN 1891.	NUMBER DIS- CONTINUED IN 1891.	TOTAL OF EACH KIND.
Cast iron, 6-inch diameter...	3	.....	.....	3
" " 4 " "	51	7	.....	58
" " 3 " "	72	10	.....	82
" " 2 " "	78	11	.....	89
" " 1 " "	4,242	1,022	.....	5,264
" " $\frac{1}{2}$ " "	14,657	2,440	.....	17,097
Wood pipe.....	611	.....	161	450
Mixed sizes	20,677	.....	8	20,669
Grand total	40,391	3,490	169	43,712

REPAIRS DEPARTMENT.

This department of the work has received prompt attention in the many items coming under its care. Three thousand four hundred and ninety taps were made with the distribution pipes, of sizes from $\frac{3}{8}$ to 4 inches.

The break which occurred in the 30-inch main in Congress street, between Second and Third streets, was promptly repaired. It was very fortunate that it occurred during the middle of the day, enabling the repair department to give it prompt action in closing the main gates. The broken pipe was taken out and a new length put in, the water being let on again the day following. In carefully examining the pieces as they were taken out, I could find no defects which could have caused the break, the metal was very homogeneous in quality and thickness, it is quite possible the joint may have been over-calked, as the break was from the hub end.

Pumping Works—The No. 1 inlet pipe was taken up the past year, and a new trench dredged out to receive it; the lay of the pipe previous to this was in a diagonal line crossing the grounds, and in dredging out a trench for the No. 4 inlet pipe, a portion of the pipe slid into said trench, rupturing two of its joints. This line of pipe has, as I have already stated, been taken up, and it has been relaid again in a line parallel with the grounds, and will have when completed an additional length of 500 feet, making a total length from the shore line of 1,505 feet; five of the lengths and two strainer boxes and one relief valve box are yet to be laid. Owing to unforeseen delays, and the cold weather being upon us we were unable to complete the laying of the same. The balance of the pieces will receive early attention the coming season.

In connection with the above mentioned work, a line of brick conduit and gate and strainer well was built. This conduit and well were built to take the place of the old gate and crib house, and a section of the iron inlet pipe running through the river bank. The conduit has an inner diameter of 5 feet. The well is 22 feet deep, with a diameter of 18 feet; the top is

arched over with brick, sprung from a number of I beams, two man-hole frames are built in the same. The well is fitted with strainer plates, two pipe thimbles of cast-iron are built in wall of the well and conduit, two box sluice gates are bolted to the thimbles, each having an opening of 5 feet diameter. The entire brick work was done by men in our employ, and has been executed in the most satisfactory manner.

The contract for dredging, taking up and relaying the inlet pipe, was awarded to Capt. Thomas Davis, of Detroit. The extra lengths of the iron inlet pipe to Stephen Pratt, of Detroit, and the box sluice gates, with the adjuncts, to the Russel Wheel & Foundry Company, of Detroit.

Considerable labor has been done on the south end of the grounds adjoining the river, in connection with the above work. The excavations of the conduit and well were hauled to the dock, and deposited along the line of the same.

Considerable grading was done at the south bank, and the surplus earth taken to the dock.

I am pleased to know that your Honorable Body have decided to have the dividing dock rebuilt the coming season. This is a very much needed improvement, the dock having been in a very unsafe and unsightly condition for some time.

When doing this work it will be well to lower the dock 18 inches to 2 feet, as the dock has always been too high, and at the present stage of the river it is doubly so. It will require some changes in the previously made plans, as we wish to simplify the work and reduce the cost to a minimum, until it becomes necessary to build of stone.

Surface Inlet—It is thought advisable to extend the same to a point in line of the south end of the dock; this will require the laying of about 700 feet of iron inlet pipe. It would be well to do this work the coming season.

The work of making a branch connection between the said surface inlet to the gate well of the No. 4 inlet may be delayed until it becomes necessary to do something with the settling basin.

It will be seen from the tenor of my last year's report that

some extensive repairs would be needed upon the settling basin and dock during the season just closed. And, as neither of these have received the projected repairs, I have thought it proper to give some explanation why this work was not prosecuted.

It has been a matter of no little concern, as from year to year the question has arisen, what ought to be done to the settling basin; fifteen years of continuous use having given rise to the conjecture that with this length of time it must be in anything but a pleasing condition. The intention having been that when it became necessary to make any extensive repairs upon it, the most substantial thing to do would be the paving of the inner surface and the building of the dividing wall or dock with stone and concrete. As a work of this kind could not be done without a very large outlay, it was deemed prudent to pump out the settling basin and ascertain to what extent a work of this kind would require, and what the probable cost would be to carry out such project. So during the close of the month of October, and the early part of November, the basin was pumped out, exposing its entire inner surface to view for inspection, and on November 5th your entire body accompanied by some of your officers, had the pleasure for the first time of seeing the inside of the basin, and as a result of which the many conjectures as to unsightly objects were not to be found, but to our astonished gaze we found what looked to us a most fertile valley, a short growth of sea grasses covering almost every available spot that was not otherwise covered with gravel. So in view of the cleanly appearance of the basin it was thought unwise to spend the amount necessary to prosecute this work, as proposed, at least for several years to come.

It has been suggested to me, by the Secretary, that a description of the settling basin, with its adjuncts, and a general lay of the grounds at the pumping works, would be of interest to the many readers of our yearly reports. In compliance with this request, I shall endeavor to be as concise as possible, and confine myself to the branch of the work immediately under my care.

Since the starting up of the work in the fall of 1877, many changes have been made in the general arrangements of the works and grounds, prominent in which is the extension of the buildings for a third engine, the building of an additional coal shed, the taking down of No. 1 and rebuilding on a larger scale, the laying of an additional 42-inch main through the grounds, and the connecting of the Nos. 1, 2 and 3 engines thereto.

Prior to the building of the settling basin, the water in the river extended some distance beyond the north end of this basin. The greater part of this ground through which it is located was of a swaly or marshy nature. In the construction of this basin, it was necessary to build, on three sides of it, walls of piles and sheet piling, to sustain the walls of puddled clay, two rows of piles and sheet piling being driven for that purpose. The north and east walls have four rows of piles and puddle walls of clay eleven feet thick. The west wall or east dock has also four rows of piles and two rows of sheet piling, with wall of puddle clay fourteen feet thick. This dock has a width of twenty-five feet, and is the dividing wall between the canal and settling basin. The south wall of the basin is the natural river bank, having a width at the ground line of 200 feet. The basin, as it now is, has a width of 350 feet, and an average length of 826 feet at the high-water line, and a depth varying from twelve to sixteen feet; its total capacity when at the high-water line, is about thirty-one million U. S. gallons.

This basin when built had but one influent and effluent pipe and conduit, and two gate and crib houses, the lower part of which were submerged in the basin. Since this, two additional influent and one effluent pipe and conduits have been added, having a direct connection to and from the basin; and, in addition to these, an independent line of conduit and influent pipe has also been added. This has a joint purpose of influent and effluent, and can be used with or without the settling basin. This is our side pass, running along the east side of the basin,

the purport of which is, to take the place of said basin, when for any cause, it may need pumping out. There are two branch connections from this side pass, one near the south end and the other north of the basin.

This side pass has an inner diameter of six feet, and a total length of pipe and conduit of 2,656 feet, gate and strainer wells intersect this line.

One of the influent conduits connecting direct to the basin, is built near the surface of the river and grounds; this is designated surface inlet, and is only used as occasion may require, when anchor ice is causing trouble by clogging the strainer at the intake of the influent pipe, and is an efficient auxiliary to our influent pipe.

Two of the influent pipes extend from the shore line out in the river 1,505 feet, and one 1,030 feet, and are submerged at their intake in twenty-five feet of water. Their diameters are five and six feet, and in twenty-five foot lengths. The pipes are made of boiler-plate, with flexible joints; lugs of wrought iron are rivetted on either side through the axes of the pipe, and held together with large joint-bolts. The flexible joints allowing the pipe to conform to the bed of the river, piles are driven at each joint and around the strainer boxes, and through the trench in the deep cutting two piles were driven at each joint, one on either side, and a saddle of 6 x 12 inch oak timber bolted to the piles, to prevent the pipe from raising, either from the back filling or the washings from the river, experience having taught us this precaution.

The effluent gate and crib-house at the north end of the basin, have been abandoned as such, and two brick gates and strainer wells were built to take its place, and were built one on either side of said conduit, about 50 feet apart centres; four branch connections were built from the wells, connecting with this conduit, and at the intersection of these branches with the main line, two well-holes were built, connecting the branches and the main together, the flow of the water passing through the branches to and from the wells, and are so

arranged with shut-off gates, that the wells may be used together or separately. The wells have an inner diameter of eighteen feet and a depth of twenty-one feet, with five-foot openings.

Since building the settling basin, the piles and sheet-piling have been cut down to about 6 feet below high water line, and the admixture of earth and clay filling above this point to the ground level, graded off to a gradual slope of about $3\frac{1}{2}$ to 1. The surplus earth was deposited inside the basin in front of the sheet piling, making a back support to the same. All the grounds east and north of the basin having been thoroughly filled in, and having had some 10 years to settle, has added solidity to the embankments. The sloping banks of the basin were sodded above high water line, and below this point covered with stone chips and fine gravel. The improvement to the appearance of the basin was very marked by this change, the piles and sheet piling had become very much disfigured with age and decay, and were very unsightly. While doing this work the water in the basin was lowered some 6 feet by partly closing the influent gates. The west wall or dividing dock between the basin and canal stands the same as when first built. This dock extends about 750 feet beyond the south end of the basin, and 300 feet north of the same, making a total length of 1,900 feet. Just west of this dock is a canal 45 feet wide between the walls of piles and sheet piling, and 17 feet deep. Coal and other supplies are brought to the works through this canal. The west side of said canal has been cut down in a similar manner as the walls inside the basin, and the earth graded off, the sloping bank sodded and graveled.

The entire grounds to the end of the dock covers an area of 60 acres, with a width of 967 feet, and a length of 2,700 feet, and a frontage on Jefferson Avenue conforming to the angle of the avenue of 1,016 feet.

In closing this report it is only courteous to say that the help in the office of my department has been very efficient and the co-operation with the other departments very harmonious.

Transmitted with this report are the locations of the pipes, mains and gates, also inventory of pipe, special castings, and tools on hand to January 2, 1892.

I also submit a sketch of the Pumping Works grounds, and its adjuncts, showing the general lay of the settling basin, with its influents and effluents, and the main pipeage. (For particular in detail see sketch.)

HENRY BRIDGE,

Superintendent of Extension and Construction.

PIPEAGE OF THE CITY OF DETROIT,

ALPHABETED BY STREETS, SHOWING THE KIND AND SIZE OF THE IRON
AND WOOD PIPE NOW IN USE.

LOCATION.	DIAM. INCHES.	KIND.
A st., from Vinewood to Hubbard.....	4	iron.
Aberle ave., crossing Russell e. side.....	4	"
Abbott st., from Cass to Tenth.....	24	"
" alley s. of, from Cass to w. line of Lognon farm.....	4	"
" alley s. of, crossing Sixth.....	6	"
" alley n. of, from First to Twelfth.....	4	"
Adair st., from 424 ft. s. of Wight to Jefferson.....	4	"
Adams ave., from John R to Randolph.....	6	"
" from Witherell to Hastings.....	4	"
" alley s. of, from 240 ft. e. of Clifford to Cass.....	4	"
" alley n. of, from Woodward to 100 ft. w. of Cass.....	4	"
Adelaide st., from Woodward to St. Antoine.....	4	"
" from St. Antoine to Hastings.....	2 1/4	wood.
" from Hastings to Orleans.....	4	iron.
" e. from Orleans, 36 ft.....	18	"
" from Orleans to Gratiot.....	10	"
Agnes ave., from Field to E. Boulevard.....	4	"
" w. from Crane 215 ft.....	4	"
Alexandrine ave., from Woodward to Cass.....	6	"
" from Cass to Third.....	4	"
" w. from Fourth 180 ft.....	3	"
" e. from Crawford 480 ft.....	4	"
" from Sixth to Seventh.....	4	"
" from alley w. of Trumbull to alley w. of Common- wealth.....	4	"
" from Woodward to w. line of Brush farm.....	4	"
" w. from Beaubien 195 ft.....	4	"
" from Beaubien to St. Antoine.....	3	"
" from St. Antoine to Rivard.....	3	wood.
" from Rivard to Russell.....	2 1/4	"
" crossing St. Antoine and Hastings.....	4	iron.
" from Russell to alley w. of Dubois.....	4	"
" from alley w. of Dubois to 63 ft. e. of Chene.....	3	"
" crossing Chene.....	4	"
" from 63 ft. e. of Chene to w. line of Grandy.....	3	wood.
" crossing Grandy.....	3	iron.
" from alley e. of McDougall to 401 ft. e. of Moran.....	4	"
Alfred st., from Woodward to Russell.....	4	"
" from Russell to Orleans.....	3	"
" from Orleans to Dubois.....	4	"
Alger ave., from 16 in. main to e. line of Woodward.....	6	"
" e. from Woodward 514 ft.....	4	"
Amherst st., w. from Junction 314 ft.....	4	"
Amsterdam st., crossing Cass.....	4	"
Annexation st., e. from Junction 558 ft.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Anthon st., w. from Junction 408 ft.	4	iron
Antietam st., from Rivard to 23 ft. w. of McDougall.	4	"
Antoinette ave., crossing Cass and Second.	4	"
" e. from Second 165 ft.	3	"
" w. from Twelfth 193 ft.	4	"
" w. from Wabash 138 ft.	4	"
Arndt st., from Gratiot to 275 ft. e. of Jos. Campau.	2½	wood.
" crossing Jos. Campau.	4	iron.
" from 275 ft. e. of Jos. Campau to alley w. of McDougall.	3	"
" from alley e. of McDougall to Elmwood.	3	"
" from Elmwood to Mt. Elliott.	4	"
Artillery ave., crossing River and Fort.	6	"
" a. from Dix 477 ft.	8	"
Ash st., from Grand River to alley e. of Trumbull.	4	"
" from alley w. of Trumbull to National.	3	wood.
" from Harrison to Twelfth.	4	iron.
" from Twelfth to alley e. of Wabash.	2½	wood.
" w. from Wabash 148 ft.	4	iron.
" crossing Fifteenth and Sixteenth.	4	"
" from Sixteenth to Seventeenth.	4	"
" from Seventeenth to Eighteenth.	3	"
" crossing Eighteenth to alley w. of.	4	"
" e. from Humboldt 166 ft.	3	"
" from Humboldt to Sullivan.	4	"
" w. from Sullivan 214 ft.	3	"
" e. from Maybury 250 ft.	4	"
" from Tillman to Twenty fourth.	4	"
" crossing Tillman and Twenty-fourth.	4	"
" from Twenty-seventh to Vinewood.	4	"
Atwater st., from Griswold to Shelby.	3	"
" from Griswold to Bates.	6	"
" from Randolph to 215 ft. e. of St. Aubin.	4	"
" from 215 ft. e. of St. Aubin to McDougall.	6	"
" alley s. of, from alley w. of Bates to Randolph.	4	"
Aurelia st., w. from Twelfth 140 ft.	4	"
B st., w. from Vinewood 313 ft.	4	"
Bagg st., from Woodward to Fifteenth.	24	"
" from Fifth to Crawford.	3	"
" crossing Crawford e.	4	"
Bagley ave., from Park to Clifford.	4	"
" alley e. of, from alley n. of Park to Cass.	4	"
" alley w. of, from 230 ft. n. of Clifford to Grand River.	4	"
Baker st., from Seventh to Twenty-fourth.	8	"
" from Seventh to Eighth.	4	"
" from Twenty fourth to Vinewood.	4	"
" crossing Twenty fifth and Vinewood a. 29 ft.	6	"
" from Hubbard to Scotten.	4	"
" alley s. of, from Wabash to Fourteenth.	4	"
Baldwin ave., from Jefferson to Kercheval.	6	"
" from Mack to Warren.	10	"
Baltimore ave., from Woodward to Crawford.	4	"
" from Woodward to Brush.	3	"
Bates st., from Atwater to Farmer.	6	"
" from Congress to Champlain.	20	"
Beacon st., from Brush to 211 ft. e. of St. Antoine.	4	"
Beaubien st., from Atwater to Clinton.	6	"

LOCATION.	DIAM. INCHES.	KIND.
Beaubien st., crossing Champlain.....	8	iron.
“ from Clinton to Watson.....	4	“
“ from Watson to Harper.....	10	“
“ from Harper to s. line N. Boulevard.....	6	“
“ from s. line of N. Boulevard to 24 inch main.....	10	“
Beaufait ave., n. from Jefferson 585 ft.....	6	“
“ from 585 ft. n. of Jefferson to 282 ft. n. of St. Paul.....	4	“
“ from 282 ft. n. of St. Paul to 263 ft. n. of Kercheval.....	6	“
“ from Mack to 295 ft. s. of Gratiot.....	6	“
“ from Gratiot to 190 ft. n. of Forest.....	6	“
Beaver st., from Vinewood to 28 ft. w. of Twenty-seventh.....	4	“
Beech st., from First to Seventh.....	4	“
Bellair st., from Riopelle to St. Aubin.....	2½	wood.
“ e. from St. Aubin 300 ft.....	4	iron.
“ w. from Dubois 100 ft.....	3	“
“ crossing Dubois and Chene.....	4	“
“ from Dubois to Grandy.....	3	“
“ from Grandy to Jos. Campau.....	2½	wood.
“ e. from McDougall 403 ft.....	4	iron.
Belle Isle ave., from Parker to 250 ft. n. of Coe.....	6	“
Bellevue ave., from Jefferson to 361 ft. n. of Berlin.....	6	“
“ from Mack to s. line of Superior.....	6	“
“ crossing Gratiot.....	6	“
“ from Gratiot to 80 ft. s. of Farnsworth.....	4	“
Belmont ave., from 16 inch main to e. line Woodward.....	6	“
Benton st., from Brush to Russell.....	4	“
Berlin st., from Gratiot to Jos. Campau.....	3	“
“ from Jos. Campau to alley w. of McDougall.....	2½	wood.
“ crossing Jos. Campau and Elmwood.....	4	iron.
“ from alley e. of McDougall to Elmwood.....	3	“
“ from Ellery to Mt. Elliott.....	4	“
Biddle st., from Twenty-seventh to 190 ft. e. of Vinewood.....	4	“
Blaine ave., from 16 inch main to w. line of Woodward.....	6	“
“ w. from Woodward 1568 ft.....	4	“
Boone st., crossing Collins.....	6	“
“ w. from Collins 314 ft.....	4	“
Boulevard East, e. side, from 255 ft. s. of Jefferson to Congress.....	6	“
“ e. side, s. from Agnes 121 ft.....	6	“
“ w. side, from Jefferson ave. main to n. line.....	6	“
“ w. side, n. from St. Paul 52 ft.....	6	“
“ both sides, crossing Mack.....	4	“
“ e. side, crossing Gratiot s.....	4	“
“ Frontenac, s. from Medbury 93 ft.....	6	“
Boulevard North, from Collins to 456 ft. w. of Sullivan.....	24	“
“ n. side, crossing Woodward.....	6	“
“ s. side, crossing Cass, Twelfth and Fourteenth.....	4	“
“ s. side, w. from Twelfth 361 ft.....	4	“
“ s. side, from e. line of Grand River to e. line of W. Boulevard.....	4	“
“ n. side, e. from Grand River 600 ft.....	4	“
“ s. side, Woodward to w. line of G. T. Ry.....	4	“
Boulevard West, e. side, s. from N. Boulevard 161 ft.....	4	“
“ from Myrtle to Visgar.....	6	“
“ from Baker to Shady lane.....	3	“
“ w. side, from Shady lane to Porter.....	4	“
“ w. side, n. from Fort st. main 40 ft.....	4	“

LOCATION.	DIAM. INCHES.	KIND.
Boulevard West, e. side, from Shady lane to 560 ft. s. of Porter.	4	iron.
" e. side, n. from Fort st. main 44 ft.	4	"
Bowen pl., from Woodward to Cass.	4	"
Brady st., from Woodward to Beaubien	6	"
" from Beaubien to Russell	4	"
Brainard st., from Cass to Third.	4	"
" from Third to alley w. of.	2½	wood.
" from Fourth to alley w. of.	4	iron.
" from alley w. of Fourth to Crawford.	3	"
" from Sixth to Seventh.	4	"
Brandon ave., from Hubbard to Junction.	4	"
Bratahaw st., from Third to Fourth.	2½	wood
Breckenridge st., w. from Fourteenth 140 ft.	4	iron.
" from 143 ft. e. of Seventeenth to Eighteenth	4	"
Brevoort pl., e. from Nineteenth 204 ft.	4	"
" crossing Twenty-second.	4	"
" e. from Twenty-second 240 ft.	2½	wood.
Brewster st., from Brush to Russell.	4	iron.
" from Riopelle to Gratiot.	4	"
Brigham st., from Third to Grand River.	30	"
" from Fourth to Eighth.	4	"
" crossing Lincoln and Twelfth.	4	"
" e. from Twelfth 196 ft.	4	"
Bristol pl., from Twenty-first to Twenty-second.	4	"
Brush st., from Atwater to Jefferson.	6	iron.
" from Jefferson to Congress.	4	"
" from Congress to Gratiot.	8	"
" from Gratiot to Wilkins.	4	"
" from Edmund to Watson.	24	"
" from Watson to Benton.	6	"
" crossing Eliot and Rowena.	4	"
" n. from Baltimore 240 ft.	3	"
" from 240 ft. n. of Baltimore to 251 ft. n. of Milwaukee.	4	"
" from s. line of N. Boulevard to 34 inch main.	8	"
" from Horton to Hamlin	4	"
Bryant st., w. from Twelfth 132 ft.	2½	wood.
Buchanan st., from Grand River to Vinewood	30	iron.
" w. from Wabash 172 ft.	4	"
" from Fourteenth to Fifteenth.	4	"
" w. from Seventeenth 169 ft.	4	"
" Eighteenth to 267 ft. w. of Humboldt	4	"
" from 75 ft. e. of Sullivan to Williams.	4	"
" from Twenty-third to w. line Twenty-fourth	4	"
" from 67 ft. e. of Scotten to Twenty-ninth.	4	"
" from Twenty-eighth s. to Twenty-eighth n. 70 ft.	6	"
" Campbell to Wesson.	4	"
" alley s. of, from Joe to Howell.	6	"
Bualey st., from Michigan to Julia.	6	"
Butternut st., from Seventh to alley e. of Trumbull	4	"
" from alley w. of Trumbull to National.	4	"
" e. from Wabash 263 ft.	4	"
" e. from Seventeenth 144 ft.	4	"
" e. from Maybury 227 ft.	4	"
" from Fifteenth to Twenty-fourth	24	"
Cast., from Vinewood to Hubbard.	4	"
adillac ave., from Pumping Works to Mack	62	"

LOCATION.	DIAM. INCHES.	KIND.
Cadillac ave., from 1,000 ft. to 2,060 ft. n. of Jefferson.....	6 "	iron.
Cadillac square, s. side, from Woodward to Randolph.....	24	"
" n. side, from Monroe to Bates.....	6	"
" alley n. of, from alley w. of Bates to Randolph.....	4	"
Calhoun st., from Brush to Russell.....	4	"
" w. from Riopelle, 159 ft.....	4	"
" from Dequindre to Dubois.....	2 1/4	wood.
" crossing St. Aubin.....	4	iron.
" from w. line of Dubois to e. line of Chene.....	4	"
" e. from Chene, 306 ft.....	2 1/4	wood.
" from 306 ft. e. of Chene to Grandy.....	3	iron.
Campau st., from River to Fort.....	6	"
" n. from Dix 448 ft.....	4	"
Campbell ave., from River to Driggs.....	6	"
" from 324 ft. s. of Fort to Celeron.....	6	"
" crossing Dix.....	6	"
" from Romeyn to Annexation.....	6	"
" from Jackson to 161 ft. n. of Herbert.....	6	"
Canfield ave., from Woodward to Third.....	30	"
" from Woodward to Third.....	4	"
" from Fourth to Crawford.....	4	"
" from Sixth to Seventh.....	3	"
" from Twelfth to 48 ft. e. of Thirteenth.....	3	"
" e. from Thirteenth 48 ft.....	4	"
" from Woodward to Collins.....	42	"
" from Woodward to Collins.....	6	"
" w. from Mt. Elliott 767 ft.....	4	"
" alley s. of; e. from Hastings 331 ft.....	3	"
" alley n. of; e. from Second 150 ft.....	3	"
" alley n. of; e. from Hastings 335 ft.....	3	"
Caniff ave., crossing Woodward.....	6	"
" w. from Woodward 27 ft.....	4	"
Canton ave., from Jefferson to 210 ft. n. of Kercheval.....	6	"
" crossing Mack.....	6	"
" from 95 ft. s. of, to 118 ft. n. of Farnsworth.....	6	"
Caroline st., w. from Twelfth 192 ft.....	3 & 4	"
Cass st., from Woodbridge to Jefferson.....	8	"
" from Jefferson to Congress.....	24	"
" from alley n. of Congress to Fort.....	24	"
" from alley n. of Michigan to Spencer.....	4	"
" alley w. of, from alley n. of Adams, to 119 ft. s. of Gilman.....	4	"
" alley w. of, s. from Gilman 119 ft.....	3	"
Cass ave., alley w. of, from Ledyard to Bagge.....	2 1/4	wood.
Cass st. and ave., from Jefferson to Joy.....	10	iron.
Cass ave., from Joy to Alexandrine.....	8	"
" crossing Canfield.....	8	"
" from Alexandrine to 118 ft. s. of D. and B. C. R. R.....	6	"
" from 118 ft. s. of D. and B. C. R. R. to Milwaukee.....	8	"
" from 24-in. main to s. line of N. Boulevard.....	8	"
" w. side crossing Putnam.....	4	"
Catherine st., from Gratiot to Rivard.....	4	"
" crossing Rivard.....	6	"
" from Rivard to Dequindre.....	4	"
" from Dequindre to St. Aubin.....	3	"
" from St. Aubin to Elmwood.....	4	"
Cavalry ave., from 188 ft. s. of Cadet to n. line of Dix.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Chaskey ave., from Dix to Toledo	4	Iron.
Chesron st., from Junction to 274 ft. w. of Campbell	4	"
Chene st., from Twelfth to Thirteenth	4	"
" from Thirteenth to Wabash	3	"
Champaign st., from Randolph to St. Aubin	30	"
" from Randolph to alley e. of	4	"
" from St. Antoine to Orleans	4	"
" from Orleans to Elmwood	6	"
" from Elmwood to 250 ft. w. of Leib	4	"
" w. from Leib 250 ft.	3	"
" from Leib to Field	4	"
" w. from Crane 228 ft.	4	"
" alley n. of, from Brush to St. Antoine	4	"
Chandler ave., from 16-in. main to e. line of Woodward	6	"
Charles J. ave., from Holcomb to McClellan	4	"
Charles st., from Sixth to Seventh	4	"
Charlevoix st., from Chene to e. line of Jos. Campau	4	"
" from Jos. Campau to alley w. McDougall	3	"
" from alley e. of McDougall to Elmwood	4	"
" w. from Mt. Elliott 217 feet	4	"
Charlotte ave., from Woodward to alley e. of Third	4	"
" w. from Fourth 131 feet	3	"
" e. from Fifth 180 ft.	4	"
Chase st., from alley e. of Russell to Riopelle	3	"
" crossing Riopelle w.	4	"
Chene st., from Atwater to 131 ft. s. of Hendrie	6	"
" from 136 ft. s. of Medbury to Harper	6	"
" from Piquette to Trombly	6	"
" from Congress to Canfield	30	"
Cherry st., from Grand River to alley w. of Trumbull	4	"
" from alley w. of Trumbull to National	3	"
" from Harrison to Twelfth	4	"
Chestnut st., from Russell to Elmwood	4	"
Chipman st., from Nineteenth to alley w. of Eighteenth	4	"
Chope pl., s. from Grand River 167 ft.	4	"
Christianity st., e. from Lansing 134 ft.	4	"
Church st., crossing Tenth to 170 ft. w.	4	"
" alley s. of, from Eighth to Tenth	4	"
Clairmont ave., from 16-in. main to w. line of Woodward	6	"
" w. from Woodward 1,275 ft.	4	"
Clark ave., from River to Fort	8	"
" from 1,000 ft. n. of Fort to s. line of M. C. R.	8	"
" from s. line of M. C. R. to Michigan	6	"
" from Michigan Car Works to Michigan	4	"
" in Car Works grounds	6	"
Clark Park, w. from Scotten 292 ft.	4	"
" e. from Clark ave. 292 ft.	4	"
Cleveland pl., crossing Crawford	4	"
" from Crawford to alley w. of Fourth	3	"
Cleveland st., e. from St. Aubin 176 ft.	4	"
" from 273 w. of Dubois to Chene	2 1/4	wood.
" e. from Chene 377 ft.	3	"
" from 377 ft. e. of, to 382 ft. e. of Chene	2 1/4	"
" from 314 ft. w. of, to e. line of Jos. Campau	4	Iron.
" e. from Jos. Campau 400 ft.	3	"
" from alley e. of McDougall to Elmwood	4	"

LOCATION.	DIAM. INCHES.	KIND.
Cleveland st., e. from Elmwood 650 ft.	8	iron.
“ from 650 ft. e. of Elmwood to w. line Burlage pl.	4	“
Cleveland ave., from e. to w. line of Woodward.	6	“
Clifford st., from e. line of Woodward to Washington.	12	“
“ from alley w. of Griswold to e. line of Washington.	4	“
“ from Park pl. to Sproat.	4	“
Clinton ave., from Gratiot to Rivard.	10	“
“ Rivard to Orleans.	16	“
“ Orleans to Elmwood.	8	“
“ w from Crane 211 ft.	4	“
Coe ave., from Vandyke to Belle Isle.	6	“
Colby ave., crossing Russell, e. side.	4	“
Collins st., from Gratiot to Canfield.	42	“
“ from Canfield to Griffin.	30	“
“ from Leland to Canfield.	4	“
“ n. from Canfield 563 ft.	3	“
“ from 563 feet n. of Canfield to 26 ft. n. of Hancock.	4	“
“ s. from Harper 150 ft.	6	“
Columbia st., from Woodward to Cass.	4	“
“ from Woodward to John R.	6	“
“ from John R. to Beaubien.	4	“
“ from Beaubien to Rivard.	6	“
“ alley s. of, from Woodward to Cass.	6	“
Columbus ave., s. from Fort 570 ft.	3	“
“ crossing Fort.	4	“
Commonwealth ave., crossing Putnam to 168 ft. n. of.	6	“
“ from Kirby to 7 ft. n. of Stanley.	6	“
“ s. from Holden 214 ft.	6	“
Company ave., from 67 ft. s. of, to 307 ft. n. of Lorman.	6	“
Concord ave., from Jefferson to 110 ft. n. of Waterloo.	6	“
“ from 320 ft. s. of Charlevoix to Mack.	6	“
“ from 90 ft. s. of Canfield to 168 ft. n. of Hancock.	6	“
Congress st., from Bates to Sixth.	30	“
“ from Randolph to St. Aubin.	24	“
“ from St. Aubin to Meldrum.	42	“
“ from Bates to Brush.	4	“
“ from St. Antoine to Mt. Elliott.	4	“
“ w. from Helen 171 ft.	4	“
“ from e. line of E. Boulevard to Field.	4	“
“ alley s. of, from Griswold to Third.	4	“
“ alley s. of, e. from Fourth 250 ft.	4	“
“ alley s. of, from Sixth to Seventh.	4	“
“ alley s. of, from 80 ft. e. of Brush to St. Antoine.	4	“
“ alley n. of, from alley w. of Woodward to Shelby.	4	“
“ alley n. of, from Shelby to Cass.	6	“
“ alley n. of, from Cass to 10 ft. w. of Third.	4	“
“ alley n. of, from Fifth to Seventh.	8	“
“ alley n. of, from Seventh to Eighth.	4	“
“ alley n. of, from alley e. of Woodward to 24 ft. e.	3	“
“ alley n. of, from alley e. of Woodward to Bates.	4	“
“ alley n. of, from alley w. of Brush to St. Antoine.	4	“
Craig ave., n. from Trombly 378 ft.	3	“
Crane ave., from Jefferson ave. main to Mack.	8	“
Crawford st., from Bagg to Lothrop.	6	“
“ n. from Lothrop 3984 ft.	4	“
“ crossing Brigham.	8	“

LOCATION.	DIAM. INCHES.	KIND.
Crawford st., crossing N. Boulevard.....	10	iron.
Cross st., alley n. of, from John R. to Randolph	4	"
Crystal st., from Trombly to Milwaukee	4	"
Custer ave., e. from Woodward 298 ft.	4	"
" e. from John R. 177 ft.	4	"
" e. from Brush 215 ft.	4	"
" from Oakland to Hastings.....	4	"
" w. from Jos. Campau 433 ft.	4	"
D st., w. from Vinewood 300 ft.	4	"
Dalzelie st., crossing Twelfth	4	"
" from Twelfth to Thirteenth	3	"
" from Foundry to Twenty-second.....	4	"
" from Twenty-third to Twenty-fourth	4	"
Dane st., crossing Collins e.	6	"
" from 330 ft. e. of Collins to 338 ft. e. of Moran	4	"
Davenport st., from Woodward to Cass.....	4	"
Davis pl., s. from Theodore 280 ft.	2 1/4	wood.
Dequindre st., from Woodbridge to Jefferson.....	6	iron
" w. side, from Jay to Waterloo.	4	"
" e. side, from Waterloo to Gratiot.....	4	"
" s. from Adelaide 305 ft.	4	"
" from Alfred to Pierce	4	"
" from Canfield to Willis.....	4	"
Division st., from Brush to St. Aubin.....	4	"
Dix ave., from Twenty-fourth to Artillery	10	"
Dragon ave., n. from River 563 ft.	6	"
" from s. line of Fort to Army.	6	"
" from 83 ft. n. of Regular to n. line of Dix.....	6	"
Driggs ave., from Junction to Campbell.....	4	"
Dry-Dock st., from Swain to Lady's Lane	4	"
Dubois st., from Atwater to Clinton.....	6	"
" from Clinton to Hunt	8	"
" from Hunt to Leland.....	6	"
" from Leland to Canfield.....	3	"
" from Canfield to 148 ft. n. of Frederick.....	4	"
" from Ferry to 328 ft. n. of Palmer.....	4	"
" from 100 ft. s. of Medbury to Harper.....	4	"
" crossing N. Boulevard	8	"
Duffield st., from Woodward to Cass.....	4	"
Dumontier ave., e. from Crane 297 ft.	4	"
Dunn st., e. from Wesson 160 ft.	3	"
E st., w. from Vinewood 416 ft.	4	"
" from Twenty-sixth to e. line of W. Boulevard	4	"
Edmund pl. from Woodward to Brush.....	34	"
Eighth st., from river to alley s. of Fort	4	"
" from Fort to alley n. of.	2 1/4	wood.
" from Baker to Michigan.....	3	iron
" from Michigan to Cherry	4	"
" from Grand River to Lysander	4	"
" s. from Brigham 40 ft.	6	"
Eighteenth st., from Fort to 50 ft. n. of Linden	6	"
" from 50 ft. n. of to 370 ft. n. of Linden	3	"
" from 370 ft. n. of to 468 ft. n. of Linden	4	"
" from 468 ft. n. of Linden to Buchanan	6	"
" from Buchanan to 362 ft. n. of Breckenridge.....	4	"
" from Grand River to 275 ft. n. of Kirby	6	"

LOCATION.	DIAM. INCHES.	KIND.
Eighteenth st., from 210 ft. s. of Stanley to s. line of N. Boulevard.....	6	iron.
" from s. line of N. Boulevard to n. line.....	8	"
" alley w. of, n. from Porter 150 ft.....	8	wood.
" alley w. of, from Brevoort to Webster pl.....	4	iron.
" alley w. of, from St. Clair to Wing pl.....	4	"
" alley w. of, from Chipman to Johnson.....	4	"
Eighteenth-and-a-half st., from River 504 ft.....	8	"
" from River to Fort.....	4	"
Elizabeth st., n. and s. sides, from alley e. of Woodward to 200 ft. w. of Brush.....	4	"
" from 200 ft. w. of Brush to Hastings.....	4	"
" alley s. of, from alley e. of Woodward to Witherell.....	3	"
Elery st., from Arndt to Berlin.....	6	"
" from Mack to Pulford.....	6	"
" from Zender to Gratiot.....	6	"
" from Forest to Hancock.....	8	"
Eliot st., from Woodward to Riopelle.....	4	"
Elm Grove ave., from Crane to Holcomb.....	4	"
Elm st., from Seventh to alley e. of Trumbull.....	4	"
" from alley w. of Trumbull to National.....	4	"
" from Harrison to alley e. of Wabash.....	4	"
Elmwood ave., from Jefferson to Monroe.....	4	"
" Monroe to Maple.....	6	"
" from Waterloo to Hunt.....	4	"
" from Hunt to Gratiot.....	6	"
Englewood ave., from 16-in. main to e. line of Woodward.....	6	"
" from e. line of Woodward to w. line of Oakland.....	4	"
Erskine st., from Woodward to Brush.....	4	"
Euclid ave., from 16-in. main to w. line of Woodward.....	6	"
Exposition Grounds, s. from River rd. 948 ft.....	4	"
F st., w. from Vinewood 140 ft.....	4	"
Farmer st., from Bates to Gratiot.....	6	"
" from 15 ft. s. to 38 ft. n. of 30-in. main in Gratiot.....	8	"
Farnsworth st., from Woodward to Beaubien.....	6	"
" from Beaubien to Russell.....	4	wood.
" from Russell to Grandy.....	4	iron.
" crossing Collins.....	6	"
" from Collins to Moran.....	3 & 4	"
" from Canton to Helen.....	4	"
" w. from Vandyke 301 ft.....	4	"
Ferdinand ave., n. from River 975 ft.....	4	"
" s. from Fort 480 ft.....	4	"
" from Porter to 116 ft. n. of Christianity.....	6	"
" from 360 ft. s. to 309 ft. n. of Dix.....	6	"
Ferry ave., from Woodward to Russell.....	4	"
" from Russell to St. Aubin.....	8	"
" from St. Aubin to Mitchell.....	4	"
" crossing Collins.....	8	"
" w. from Moran 247 ft.....	4	"
" w. from Vandyke 263 ft.....	4	"
" alley s. of, from alley w. of St. Aubin w. 168 ft.....	2 1/4	wood.
Field ave., from Jefferson to 1,558 ft. n. of Kercheval.....	6	iron.
" from 4 ft. s. of Mack to 177 ft. n. of Medbury.....	6	"
Fifth st., from Congress to alley n.....	8	"
" from alley s. of to alley n. of Lafayette.....	4	"
" from Labrosse to alley n. of.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Fifth st., from Michigan to Noble, and on both sides of Elton and Crawford parks.....	4	iron.
Fifth ave., from Holden to 141 ft. s. of Piquette.....	4	"
" from 16-in. main to w. line of Woodward.....	6	"
" w. from Woodward 183 ft.....	4	"
Fifteenth st., from Fort to Grand River.....	6	"
" from Baggs to Buchanan.....	24	"
" n. from Warren 348 ft.....	6	"
" s. from 94-in. main in N. Boulevard 68 ft.....	6	"
First st., from Front to Jefferson.....	6	"
" from Jefferson to alley n. of.....	8	"
" crossing Congress.....	8	"
" Woodbridge to Fort.....	4	"
" Fort to Grand River.....	6	"
Fisher ave., from Jefferson to 118 ft. n. of St. Paul.....	6	"
Fletcher st., w. from Weason ave. 238 ft.....	4	"
Florence st., n. of Harper 124 ft.....	3	"
" from 134 ft. to 265 ft. n. of Harper.....	4	"
Flower st., n. from Forest ave. main 36 ft.....	4	"
" n. from Forest 260 ft.....	3	"
Forest ave., from Woodward to Cass.....	4	"
" n. and s. sides, from Cass to Third.....	4	"
" from Fourth to Seventh.....	4	"
" crossing Trumbull.....	4	"
" from National to 190 w. of Twelfth.....	4	"
" from Woodward to 294 w. of Rivard.....	4	"
" from Russell to 377 ft. e. of Chene.....	4	"
" w. from Grandy 226 ft.....	24	wood.
" crossing Collins.....	6	iron.
" from Collins to Moran.....	4	"
" from 124 ft. w. of Ellery to Mt. Elliott.....	4	"
" w. from Beaufait 157 ft.....	4	"
" alley n. of, crossing Orleans w. side.....	4	"
" alley n. of, from w. line of Orleans to alley e. of Riopelle.....	3	"
Fort st., from Woodward to Griswold.....	4	"
" from Woodward to Seventh.....	16	"
" from Seventh to Fourteenth.....	6	"
" from Fourteenth to Hoffman.....	6	"
" from Hoffman to Twenty-fourth.....	6	"
" from Twenty-fourth to Artillery.....	8	"
" from St. Antoine to Mt. Elliott.....	4	"
" w. from Helen 168 ft.....	4	"
" alley n. of, w. from Brush 125 ft.....	24	wood.
" alley n. of, from Brush to St. Antoine.....	4	iron.
Foundry st., from Baker to Michigan.....	6	"
Fourth st., from Woodbridge to Larned.....	4	"
" from Larned to Congress.....	6	"
" from Fort to Grand River.....	6	"
Fourth ave., from Grand River to Baggs.....	4	"
" from Baggs to Brigham.....	6	"
" from Brigham to Holden.....	4	"
" alley w. of, from Brainard to alley n. of.....	4	"
" alley w. of, from Selden to alley s. of.....	4	"
" from 16 inch main to w. line of Woodward.....	6	"
Fourteenth ave., from Fort to Lafayette.....	6	"
" w. side, n. from Porter 402 ft.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Fourteenth ave., from Lafayette to Bagg.....	10	iron.
“ from Bagg to Grand River.....	8	“
“ from Grand River to s. line of N. Boulevard.....	6	“
“ crossing N. Boulevard to s. line.....	8	“
Fox st., from Frank to Alexandrine.....	3	“
“ crossing Alexandrine.....	4	“
Frank st., from Fourth to 114 ft. w. of Sixth.....	4	“
“ from 114 ft. w. of Sixth to alley e. of Seventh.....	3	“
Franklin st., from Randolph to Beaubien.....	4	“
“ from Beaubien to Orleans.....	6	“
“ from Orleans to 35 ft. e. of Dequindre.....	4	“
“ from 35 ft. e. of Dequindre to McDougall.....	6	“
“ from Walker to Adair.....	4	“
“ crossing Leib w. side.....	4	“
“ w. from Leib 310 ft.....	2½	wood.
“ alley s. of, from McDougall to Walker.....	4	iron.
“ alley n. of, from McDougall to Walker.....	4	“
Frederick st., from Woodward to 178 ft. e. of Russell.....	4	“
“ from 252 ft. w. of Sd. Aubin to alley w. of Dubois.....	4	“
“ crossing Collins.....	6	“
“ e. from Helen 124 ft.....	4	“
“ w. from Vandyke 255 ft.....	4	“
Front st., from 170 ft. e. of First to Second.....	4	“
“ e. from Third 107 ft.....	6	“
“ alley n. of, from Second to Third.....	4	“
Frontenac Boulevard, s. from Medbury 93 ft.....	6	“
Gallagher pl., from Crawford to alley w. of Fourth.....	4	“
Garfield ave., from Woodward to w. line of Brush farm.....	4	“
“ from 255 ft. w. of Beaubien to e. line of St. Antoine.....	4	“
“ w. from Hastings 359 ft.....	3	“
“ from Hastings to Rivard.....	4	“
“ from Russell to 47 ft. e. of Chene.....	4	“
“ from 47 ft. e. of Chene to Grandy.....	3	wood.
“ crossing Grandy.....	4	iron.
“ crossing Collins.....	6	“
“ w. from Beaufait 182 ft.....	4	“
“ alley s. of, w. from Hastings 360 ft.....	4	“
Gilbert st. e. from Scotten 268 ft.....	4	“
Gilman st., from Cass to Grand River.....	4	“
Gladstone ave., from 16-in. main to w. line of Woodward.....	6	“
“ crossing Vinewood e. side.....	4	“
Glynn court, from 16-in. main to w. line of Woodward.....	6	“
“ w. from Woodward 300 ft.....	4	“
Goethe st., e. from McClellan 228 ft.....	4	“
Goldner ave., from Michigan to G. T. Ry.....	6	“
Grand River ave., from Woodward to Cass.....	8	“
“ from Cass to Third.....	6	“
“ from Third to 400 ft. w. of Humboldt.....	8	“
“ from 400 w. of Humboldt to city limits.....	6	“
“ from Brigham to Buchanan.....	30	“
“ connecting 8-in. to 30-in. in Buchanan 22 ft.....	8	“
“ s. side, from Second to 56 ft. e. of Cherry.....	4	“
“ n. side, e. from Eighth 110 ft.....	3	“
“ alley n. of, w. from Lincoln 47 ft.....	4	“
“ alley n. of, from 47 ft. w. of Lincoln to alley w. of.....	2½	wood.
“ alley n. of, from Trumbull to alley w. of.....	6	iron.

LOCATION.	DIAM. INCHES.	KIND.
Fifth st., from Michigan to Noble, and on both sides of Elton and Crawford parks.....	4	iron.
Fifth ave., from Holden to 144 ft. s. of Piquette.....	4	"
" from 16-in. main to w. line of Woodward.....	6	"
" w. from Woodward 182 ft.....	4	"
Fifteenth st., from Fort to Grand River.....	6	"
" from Baggs to Buchanan.....	24	"
" n. from Warren 348 ft.....	6	"
" s. from 24-in. main in N. Boulevard 68 ft.....	6	"
First st., from Front to Jefferson.....	6	"
" from Jefferson to alley n. of.....	8	"
" crossing Congress.....	8	"
" Woodbridge to Fort.....	4	"
" Fort to Grand River.....	6	"
Fisher ave., from Jefferson to 118 ft. n of St. Paul.....	6	"
Fletcher st., w. from Weason ave. 236 ft.....	4	"
Florence st., n. of Harper 124 ft.....	3	"
" from 124 ft. to 365 ft. n. of Harper.....	4	"
Flower st., n. from Forest ave. main 36 ft.....	4	"
" n. from Forest 260 ft.....	3	"
Forest ave., from Woodward to Cass.....	4	"
" n. and s. sides, from Cass to Third.....	4	"
" from Fourth to Seventh.....	4	"
" crossing Trumbull.....	4	"
" from National to 190 w. of Twelfth.....	4	"
" from Woodward to 334 w. of Rivard.....	4	"
" from Russell to 377 ft. e. of Chene.....	4	"
" w. from Grandy 235 ft.....	24	wood.
" crossing Collins.....	6	iron.
" from Collins to Moran.....	4	"
" from 124 ft. w. of Ellery to Mt. Elliott.....	4	"
" w. from Beaufait 157 ft.....	4	"
" alley n. of, crossing Orleans w. side.....	4	"
" alley n. of, from w. line of Orleans to alley e. of Riopelle....	3	"
Fort st., from Woodward to Griswold.....	4	"
" from Woodward to Seventh.....	16	"
" from Seventh to Fourteenth.....	6	"
" from Fourteenth to Hoffman.....	8	"
" from Hoffman to Twenty-fourth.....	6	"
" from Twenty-fourth to Artillery.....	8	"
" from St. Antoine to Mt. Elliott.....	4	"
" w. from Helen 168 ft.....	4	"
" alley n. of, w. from Brush 135 ft.....	24	wood.
" alley n. of, from Brush to St. Antoine.....	4	iron.
Foundry st., from Baker to Michigan.....	6	"
Fourth st., from Woodbridge to Larned.....	4	"
" from Larned to Congress.....	8	"
" from Fort to Grand River.....	6	"
Fourth ave., from Grand River to Baggs.....	4	"
" from Baggs to Brigham.....	6	"
" from Brigham to Holden.....	4	"
" alley w. of from Brainard to alley n. of.....	4	"
" alley w. of, from Selden to alley s. of.....	4	"
" from 16 inch main to w. line of Woodward.....	6	"
Fourteenth ave., from Fort to Lafayette.....	8	"
" w. side, n. from Porter 402 ft.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Fourteenth ave., from Lafayette to Bagg.....	10	iron.
" from Bagg to Grand River.....	8	"
" from Grand River to s. line of N. Boulevard.....	6	"
" crossing N. Boulevard to s. line.....	8	"
Fox st., from Frank to Alexandrine.....	3	"
" crossing Alexandrine.....	4	"
Frank st., from Fourth to 114 ft. w. of Sixth.....	4	"
" from 114 ft. w. of Sixth to alley e. of Seventh.....	3	"
Franklin st., from Randolph to Beaubien.....	4	"
" from Beaubien to Orleans.....	6	"
" from Orleans to 25 ft. e. of Dequindre.....	4	"
" from 25 ft. e. of Dequindre to McDougall.....	6	"
" from Walker to Adair.....	4	"
" crossing Leib w. side.....	4	"
" w. from Leib 310 ft.....	2 1/4	wood.
" alley s. of, from McDougall to Walker.....	4	iron.
" alley n. of, from McDougall to Walker.....	4	"
Frederick st., from Woodward to 178 ft. e. of Russell.....	4	"
" from 252 ft. w. of St. Aubin to alley w. of Dubois.....	4	"
" crossing Collins.....	6	"
" e. from Helen 124 ft.....	4	"
" w. from Vandyke 253 ft.....	4	"
Front st., from 170 ft. e. of First to Second.....	4	"
" e. from Third 107 ft.....	6	"
" alley n. of, from Second to Third.....	4	"
Frontenac Boulevard, s. from Medbury 93 ft.....	6	"
Gallagher pl., from Crawford to alley w. of Fourth.....	4	"
Garfield ave., from Woodward to w. line of Brush farm.....	4	"
" from 255 ft. w. of Beaubien to e. line of St. Antoine.....	4	"
" w. from Hastings 359 ft.....	3	"
" from Hastings to Rivard.....	4	"
" from Russell to 47 ft. e. of Chene.....	4	"
" from 47 ft. e. of Chene to Grandy.....	3	wood.
" crossing Grandy.....	4	iron.
" crossing Collins.....	6	"
" w. from Beaufait 182 ft.....	4	"
" alley s. of, w. from Hastings 300 ft.....	4	"
Gilbert st. e. from Scotten 368 ft.....	4	"
Gilman st., from Cass to Grand River.....	4	"
Gladstone ave., from 16-in. main to w. line of Woodward.....	6	"
" crossing Vinewood e. side.....	4	"
Glynn court, from 16-in. main to w. line of Woodward.....	6	"
" w. from Woodward 300 ft.....	4	"
Goethe st., e. from McClellan 228 ft.....	4	"
Goldner ave., from Michigan to G. T. Ry.....	6	"
Grand River ave., from Woodward to Cass.....	8	"
" from Cass to Third.....	6	"
" from Third to 400 ft. w. of Humboldt.....	8	"
" from 400 w. of Humboldt to city limits.....	6	"
" from Brigham to Buchanan.....	30	"
" connecting 8-in. to 30-in. in Buchanan 22 ft.....	8	"
" s. side, from Second to 56 ft. e. of Cherry.....	4	"
" n. side, e. from Eighth 110 ft.....	3	"
" alley n. of, w. from Lincoln 47 ft.....	4	"
" alley n. of, from 47 ft. w. of Lincoln to alley w. of....	2 1/4	wood.
" alley n. of, from Trumbull to alley w. of.....	6	iron.

LOCATION.	DIAM. INCHES.	KIND.
Grandy ave., from Gratiot to Pierce.....	4	iron.
" from Pierce to Harper.....	6	"
" n. from Harper 323 ft.....	4	"
" from 323 ft. n. of Harper to 186 ft. n. of Trombly.....	6	"
Grant court, n. from Warren 313 ft.....	4	"
Grant st., crossing Twelfth.....	4	"
" from Twelfth to Thirteenth.....	3	"
Granville st., from Thirteenth to Wabash.....	3	"
" crossing Wabash.....	4	"
Gratiot ave., from Woodward to Brush.....	10	"
" from Woodward to Raynor.....	30	"
" from Brush to 64 ft. w. of Sheridan.....	6	"
" from 64 ft. w. of Sheridan to 266 ft. w. of Butler.....	8	"
" w. from Butler 266 ft.....	6	"
Green ave., from Holden to Milwaukee.....	6	"
" s. from 24-in. main in N. Boulevard 87 ft.....	6	"
Griffin ave., e. from Mitchell 68 ft.....	4	"
Griswold st., from Atwater to State.....	6	"
" s. from 12-in. main in Clifford 60 ft.....	10	"
" from Detroit River to Atwater.....	3	"
Guoin st., from e. line of Mullett Farm to Orleans.....	4	"
" from Orleans to 230 ft. e. of St. Aubin.....	3	"
" from 230 ft. e. of St. Aubin to Dubois.....	4	"
" from Chene to Jos. Campau.....	4	"
" from Jos. Campau to Walker.....	6	"
Haigh ave., from 16-in. main to e. line of Woodward.....	6	"
" e. from Woodward 158 ft.....	4	"
Hale st., crossing Riopelle.....	4	"
" from Riopelle to 300 ft. w. of St. Aubin.....	2 1/4	wood.
" w. from St. Aubin 300 ft.....	3	"
" crossing St. Aubin to 275 ft. e.....	4	iron.
" w. from Dubois 162 ft.....	3	"
" from Dubois to Chene.....	4	"
" from Chene to Grandy.....	3	"
" from Grandy to Jos. Campau.....	2 1/4	wood.
Hamlin ave., from Woodward to Oakland.....	4	iron.
Hammond ave., from Toledo to s. line of L. S. R. R.....	6	"
" from 356 ft. s. of Leavitt to 175 ft. n. of Ranspach.....	6	"
" s. from Horatio 956 ft.....	6	"
Hancock ave., from Cass to 112 ft. e. of Riopelle.....	4	"
" from St. Aubin to Dubois.....	4	"
" from 281 ft. w. of Chene to Grandy.....	4	"
" crossing Mitchell to 235 ft. e.....	4	"
" crossing Collins.....	6	"
" from Collins to Moran.....	4	"
" from alley w. of Ellery pl. to alley w. of Mt. Elliott.....	4	"
" from Fourth to w. line of Trumbull.....	4	"
" from National to 130 ft. w. of Thirteenth.....	4	"
" from Wabash to Fourteenth.....	3	"
" crossing Fourteenth.....	4	"
" from e. line of Twenty-fourth to Twenty-fifth.....	4	"
" from Twenty-seventh to w. line of Vinewood.....	4	"
" from LaSalle to Scotten.....	4	"
Hanover ave., crossing Russell e. side.....	4	"
Harmon ave., from 16 in. main to e. line of Woodward.....	6	"
" from e. line of Woodward to Oakland.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Harper ave., from Woodward to Russell.....	4	iron.
" from Widman pl. to 184 e. of Dubois.....	4	"
" e. from Chene 147 ft.....	4	"
" from 147 ft. e. of Chene to w. line of Grandy.....	2 3/4	wood.
" from w. line of Grandy to e. line of Mitchell.....	4	iron.
" from w. line of Collins to Moran.....	6	"
" w. from Twelfth 178 ft.....	4	"
" w. from Fourteenth 134 ft.....	4	"
Harrison ave., from Michigan to Grand River.....	4	"
" from Merrick to 343 ft. n. of Kirby.....	4	"
" alley w. of, from Linden s. to Linden n.....	4	"
Harvey ave., from Junction to 500 ft. w. of Campbell.....	4	"
Hastings st., from 16 in. main to s. line of Jefferson.....	16	"
" from Jefferson to Champlain.....	24	"
" from Congress to Clinton.....	6	"
" from 118 ft. s. of Congress to Fort.....	3	"
" from Champlain to Monroe.....	3	"
" from Clinton to Catherine.....	4	"
" from Catherine to Watson.....	6	"
" from Watson to Canfield.....	10	"
" from Canfield to n. line of Warren.....	8	"
" crossing Theodore.....	8	"
" from Farnsworth to Ferry.....	6	"
" from Harper to Piquette.....	6	"
" from Piquette to s. line of N. Boulevard.....	4	"
" from 24 in. main to s. line of N. Boulevard.....	8	"
" from N. Boulevard to Custer.....	4	"
" s. from Pallister 266 ft.....	6	"
" alley w. of, s. from Custer 26 ft.....	4	"
" alley w. of, from 26 ft. s. of Custer to N. Boulevard.....	3	"
Hazel st., from Harrison to 156 ft. w. of Twelfth.....	4	"
" from 156 ft. w. of Twelfth to 90 ft. e. of Thirteenth.....	3	"
" e. from Thirteenth 96 ft.....	4	"
Hazelwood ave., from 16 in. main to w. line of Woodward.....	6	"
" from w. line of Woodward to Auburndale.....	4	"
Heck pl., crossing Forest.....	4	"
" from Forest to Hancock.....	3	"
Heidelberg st., crossing Jos. Campau.....	4	"
" e. from Jos. Campau 270 ft.....	2 3/4	wood.
" from 270 ft. to 445 ft. e. of Jos. Campau.....	3	iron.
" from alley e. of McDougall to Elmwood.....	3	"
" crossing Elmwood w. side 39 ft.....	4	"
Helen ave., from Jefferson to Monroe.....	6	"
" from Gratiot to 132 ft. n. of Medbury.....	6	"
" crossing Mack.....	6	"
Hendricks st., from St. Aubin to Dubois.....	3	"
" from Dubois to alley w. of McDougall.....	4	"
" from alley e. of McDougall to Elmwood.....	4	"
" w. from Mt. Elliott 186 ft.....	4	"
Henrie ave., from Woodward to 550 ft. e. of John R.....	4	"
" from e. line of Grandy to 408 w. of.....	4	"
" from Mitchell to e. line of McDougall.....	6	"
" w. from Vandyke 219 ft.....	4	"
Henry st., from Woodward to Clifford.....	4	"
" from Cass to Third.....	6	"
" from Third to alley e. of.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Herbert st., from Scotten to 134 ft. w. of Lovett.....	4	iron.
Hibbard ave., from Jefferson to 203 ft. n. of Brinket.....	6	"
High st., from Grand River to Beaubien.....	4	"
" from Beaubien to A. Beaubien farm, w. line.....	3	"
" from w. line of A. Beaubien farm to Russell.....	4	"
" from Russell to Riopelle.....	3	"
" from Grand River to Fourth.....	3	"
" from Fourth to alley w. of Trumbull.....	4	"
" from alley w. of Trumbull to National.....	3	"
Hoffman st., from River to Fort.....	8	"
Holbrook road, from 16-in. main to e. line of Woodward.....	6	"
Holcomb ave., from Jefferson to Lorman.....	6	"
" from Elm Grove to alley s. of Mack.....	6	"
Holden ave., from Woodward to w. line of Second.....	6	"
" from w. line of Second to Third.....	3	wood.
" from Third to Fourth.....	4	iron.
" from Fourth to Crawford.....	3	wood.
" from Crawford to Commonwealth.....	4	iron.
" s. from 24-in. main in N. Boulevard 95 ft.....	10	"
Hooker ave., n. from Grand River 63 ft.....	4	"
" w. from Eighteenth 596 ft.....	4	"
Horatio st., from Hammond to Welch.....	6	"
" from Welch to Livernois.....	4	"
Horton ave., from Woodward to Oakland.....	4	"
Howard st., from Tenth to Twelfth.....	4	"
" from M. C. R. R. Bridge to Twenty-fourth.....	6	"
" from Twenty-fourth to Twenty-fifth.....	4	"
" e. from Scotten 354 ft.....	4	"
" w. from Junction 371 ft.....	4	"
Howell st., from Buchanan to alley s. of.....	6	"
Hubbard ave., from Fort to 335 ft. n. of Brandon.....	6	"
" from E to Michigan.....	4	"
" from Michigan to Viagar.....	6	"
Hudson ave., w. from Crawford 564 ft.....	4	"
" from Maybury to Twenty-third.....	4	"
" from Twenty-sixth to e. line of Vinewood.....	4	"
Humboldt ave., from Michigan to Butternut.....	4	"
" crossing Butternut and Buchanan.....	6	"
" from Butternut to s. line of D. & B. C. R. R.....	4	"
" from Grand River to McGraw.....	6	"
Hunt st., from Dubois to alley w. of McDougall.....	4	"
" from alley e. of McDougall to Elmwood.....	4	"
" from 15 ft. e. of Ellery to Mt. Elliott.....	4	"
Huron st., s. from Locust 395 ft.....	3	"
" from Locust to Bagg.....	3 1/4	wood.
Illinois st., w. from Beaubien 370 ft.....	3 1/4	"
" from 370 ft. w. of, to 564 w. of Beaubien.....	3	iron.
" crossing Beaubien, St. Antoine and Hastings.....	4	"
" from Beaubien to Russell.....	3 1/4	wood.
" from Russell to St. Aubin.....	4	iron.
" crossing Russell and St. Aubin.....	4	"
" from St. Aubin to Grandy.....	3	"
" crossing Dubois and Chene.....	4	"
" from Grandy to Jos. Campau.....	3 1/4	wood.
" e. from McDougall 341 ft.....	3	iron.
" from 211 ft. e. of to 431 ft. e. of McDougall.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Illinois st., w. from Moran 198 ft.....	4	iron.
Indiana st., from Beaubien to St. Antoine.....	8	wood.
" crossing St. Antoine and Hastings.....	4	iron.
" from St. Antoine to Rivard....	2½	wood.
" crossing Rivard and Russell.....	4	iron.
" from Rivard to Russell.....	8	wood.
Ingersoll st., e. from Weason 226 ft.....	4	iron.
Iron st., from Wight to Jefferson.....	6	"
Irving ave., from Auburndale to 473 ft. w. of Seventh.....	4	"
Irving st., from Crawford to Seventh.....	4	"
Jackson st., from Scotten to Lovett.....	4	"
" from Twenty-eighth to Twenty-ninth.....	4	"
Jay st., from Riopelle to 44 ft. w. of McDougall.....	4	"
Jefferson ave., from Griswold to Orleans.....	10	"
" from Second to Hastings.....	16	"
" from Deguire to M. C. R. R. belt line.....	6	"
" from M. C. R. R. belt line to McClellan.....	6	"
" from Meldrum to Pumping Works.....	42	"
" from Griswold to First.....	8	"
" alley s. of, from alley w. of Woodward to alley w. of Griswold.....	4	"
" alley s. of, from Shelby to Cass.....	4	"
" alley s. of, from alley w. of Bates to Randolph....	4	"
" alley s. of, from Brush to Beaubien.....	8	"
" alley s. of, e. from Beaubien 189 ft.....	4	"
" alley s. of, crossing Wayne.....	4	"
" alley n. of, from alley w. of Bates to St. Antoine.....	4	"
" alley n. of, from alley e. of Griswold to First.....	4	"
" alley n. of, from First to Third.....	8	"
Jerome ave., n. from Piquette 473 ft.....	8	"
" from Milwaukee to s. line of N. Boulevard.....	4	"
" s. from 24-in. main in N. Boulevard 87 ft.....	6	"
Joe st., from Michigan ave. to alley s. of Buchanan.....	6	"
John R. st., from e. line of Woodward to Miami.....	12	"
" from Miami to Adams.....	4	"
" from Adams to Columbia.....	6	"
" from Columbia to Edmund.....	8	"
" from Edmund to Erskine.....	6	"
" crossing Elliot and Rowena.....	6	"
" from Brady to Piquette.....	6	"
" n. from Baltimore 260 ft.....	3	"
" s. from Milwaukee 30 ft.....	6	"
" crossing N. Boulevard.....	8	"
" from alley s. of Custer to Hamlin.....	6	"
Johnson st., from Nineteenth to alley w. of Eighteenth.....	4	"
Jones st., from Cass to 160 ft. w. of Fifth.....	4	"
" e. from Sixth 240 ft.....	3	"
Jos. Campan ave., from Atwater to Clinton.....	6	"
" from Jay to s. line of Gratiot.....	6	"
" from s. line of Gratiot to St. Joseph.....	4	"
" from St. Joseph to 128 ft. n. of Forest.....	6	"
" Theodore to 238 ft. n. of Arthur.....	6	"
" crossing N. Boulevard.....	8	"
Josephine ave., from e. to w. line of Woodward.....	6	"
Joy st., from Cass to alley e. of Third.....	4	"
" from Fourth to Fifth.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Junction ave., from River to Driggs.....	6	iron.
" from s. line of Wabash R. R. to s. line of Fort	6	"
" from s. line of Fort to 177 ft. n. of Norton.....	8	"
Kanter ave., from 185 ft. w. of Collins to Moran.....	4	"
" crossing Collins.....	6	"
" w. from Mt. Elliott 181 ft.....	4	"
Kercheval ave., from Mt. Elliott to Beaufait.....	4	"
" from Field to Baldwin.....	4	"
King ave., from 16 in. main to e. line of Woodward.....	6	"
Kinsman st., from Scotten to Twenty-eighth.....	4	"
Kirby ave., from Woodward to w. line of Cass.....	4	"
" w. from Fourth 180 ft.....	4	"
" e. from Crawford 430 ft	3	"
" from Crawford to w. line of Trumbull.....	4	"
" from Commonwealth to National.....	4	"
" from Harrison to 195 ft. w. of Twelfth.....	4	"
" w. from Fourteenth 135 ft.....	4	"
" from Sixteenth to Eighteenth.....	4	"
" w. from Twenty-seventh 347 ft.....	4	"
" crossing John R. and Grandy.....	4	"
" e. from Russell 216 ft.....	4	"
" e. from St. Aubin 300 ft.....	4	"
" w. from Chene 440 ft.....	4	"
" crossing Collins.....	6	"
" e. from Helen 338 ft.....	4	"
Koch ave., from 16 in. main to e. line of Woodward.....	6	"
" from e. line of Woodward to Oakland.....	4	"
Labrosse st., from Fourth to Fifth.....	4	"
" w. from Tenth 430 ft.....	3	"
" from 430 ft. w. of Tenth to Twelfth.....	4	"
" alley s. of, from Fourth to alley e. of Twelfth.....	4	"
" alley n. of, from alley e. of Fifth to Eighth.....	4	"
" alley n. of, from Eighth to Tenth.....	3	"
Lady's lane, n. from Dry-Dock 214 ft.....	4	"
Lafayette ave., from Griswold to Shelby	4	"
" w. from Tenth 743 ft.....	4	"
" from 743 ft. w. of Tenth to M. C. R. R. bridge.....	3	"
" from Twelfth to Fourteenth.....	4	"
" from w. line of Fourteenth to Fifteenth.....	3	"
" from Fifteenth to alley w. of Sixteenth.....	4	"
" from Twenty second to alley e. of	4	"
" from Twenty-third to Twenty-fourth.....	4	"
" e. from Scotten 256 ft.....	4	"
" alley s. of, from Griswold to Shelby.....	6	"
" alley s. of, from Wayne to First.....	6	"
" alley s. of, from First to Fourth.....	4	"
" alley s. of, from Fifth to Tenth.....	4	"
" alley n. of, from Shelby to First.....	4	"
" alley n. of, from First to Tenth.....	6	"
" alley n. of, w. from Tenth 323 ft.....	4	"
" alley n. of, e. from Fourteenth 190 ft.....	3	"
Lafayette pl., e. from Scotten 354 ft.....	4	"
Lafferty st., from River to Fort	4	"
" from Fort to s. side M. C. R. R.....	6	"
Lambie pl., e. from Twenty-second 240 ft.....	2 1/2	wood.
" crossing Twenty second	4	iron.

LOCATION.	DIAM. INCHES.	KIND.
Langley ave., from Fourth to 506 ft. w. of Crawford	4	iron.
Lawman st., crossing Vinewood, e. side	4	"
Leasing ave., from Fort to 156 ft. n. of Christianity	6	"
" from Dix to Toledo	6	"
Larned st., from Third to Hastings	16	"
" from Bates to Brush	4	"
" from St. Antoine to Dequindre	4	"
" from Riopelle to St. Aubin	12	"
" from St. Aubin to Elmwood	4	"
" crossing Leib, e. side	4	"
" from Leib to Mt. Elliott	2 1/4	wood.
" crossing Mt. Elliott, w. side	4	iron.
" w. from Helen 156 ft.	4	"
" from Woodward to alley w. of	8	"
" from Third to Fourth	8	"
" from Fourth to Fifth	4	"
La Salle ave., n. from Michigan 505 ft.	6	"
" from n. line of Grand Trunk R. R. to 400 ft. n. of Nall	6	"
" from 399 ft. s. to 398 ft. n. of Hancock	6	"
" s. from McGraw 335 ft.	6	"
Lauderdale ave., w. from Junction 106 ft.	4	"
Laurel st., from Grand River to Wabash	4	"
Leavitt ave., from Weeson to Livernols	4	"
Ledyard st., from Cass to Third	6	"
Leib st., from Wight to Jefferson	6	"
" from Jefferson to Champlain	4	"
" from Champlain to Monroe	3	"
Leicester court, from 16-in. main to e. line of Woodward	6	"
" e. from Woodward 940 ft.	4	"
Leland st., w. from Beaubien 206 ft.	3	"
" from Beaubien to 21 ft. e. of Dequindre	4	"
" from 21 ft. e. of Dequindre to 101 ft. w. of Dubois	2 1/4	wood.
" from 101 ft. w. of Dubois to Chene	3	iron.
" crossing Chene	4	"
" e. from Chene 160 ft.	3	"
" from 160 ft. e. of Chene to Grandy	2 1/4	wood.
" crossing Grandy	3	iron.
" from Grandy to Jos. Campau	2 1/4	wood.
" crossing Jos. Campau and McDougall	4	iron.
" from Jos. Campau to McDougall	2 1/4	wood.
" from McDougall to Collins	3	iron.
" from 216 ft. w. of Moran to Gratiot	4	"
Leroy pl., n. from Forest 251 ft.	3	"
Leasing st., e. from McClellan 158 ft.	4	"
Leverette st., from Seventh to Eighth	4	"
" e. from Twelfth 307 ft.	3 & 4	"
" alley s. of, from Eighth to Tenth	4	"
Lewis st., from Cass to Fourth	4	"
Lincoln ave., from Grand River to alley n. of	4	"
" crossing Brigham n. side 36 ft.	8	"
" from Brigham to 510 ft. n. of Holden	6	"
" s. from 24-in. main in N. Boulevard 64 ft.	6	"
" alley w. of, from alley n. of Grand River to s. line of Brigham	4	"
" alley w. of, crossing Brigham s. side 16 ft.	6	"
Linden st., w. from Harrison 140 ft.	4	"

LOCATION.	DIAM. INCHES.	KIND.
Linden st., e. from Twelfth 218 ft.	2 1/4	wood.
" from Twelfth to Wabash	2 1/4	"
" crossing Twelfth and Thirteenth	4	iron.
" from Wabash to 45 ft. e. of Fourteenth	3	"
" crossing Wabash and Sixteenth	4	"
" from Sixteenth to Eighteenth	2 1/4	wood.
" crossing Humboldt	4	iron.
" from alley w. of Humboldt to Maybury	4	"
" from Tillman to Twenty-fourth	4	"
" from Twenty-fifth to 26 ft. e. of Twenty-sixth	4	"
Livernois ave., from Dix to M. C. R. R.	6	"
" from M. C. R. R. to n. line of city limits	10	"
Locust st., from Grand River to Fourth	6	"
" from Fourth to alley e. of Trumbull	4	"
" from alley w. of Trumbull to 30 ft. e. of National	3	"
" e. from National 30 ft.	4	"
" from Harrison to Wabash	4	"
Lorman ave., from Crane to Company	4	"
Louis ave., from Crane to w. line of Holcomb	4	"
Lovett ave., from Michigan to Buchanan	6	"
" from Rich to 264 ft. n. of Herbert	6	"
Ludden st., from Gratiot to Mt. Elliott	4	"
Lyman st., from Crystal to Orleans	4	"
Lysander st., from Fourth to Crawford	3	"
" crossing Sixth w. side	4	"
" from Sixth to Seventh	3	"
" from Seventh to Lincoln	4	"
" from National to 199 ft. w. of Twelfth	4	"
McArthur st., w. from Twenty-seventh 340 ft.	4	"
McClellan ave., from Jefferson to Marietta	6	"
" from Marietta to Mack	8	"
" from s. line of Mack to 144 ft. n. of Julia H.	10	"
McDougall ave., from Atwater to Clinton	6	"
" from Gratiot to Canfield	4	"
" from Canfield to 154 ft. n. of Garfield	6	"
" from s. line of Palmer to Hendrie	6	"
" alley w. of, from Mullett to Jay	4	"
" alley w. of, from Cleveland to Hendricks	3	"
" alley w. of, from Hendricks to Hunt	4	"
" alley w. of, from Hunt to Charlevoix	3	"
" alley w. of, from Charlevoix to Arndt	3	wood.
" alley w. of, from Arndt to Berlin	4	iron.
" alley w. of, from Berlin to Heidelberg	2 1/4	wood.
" alley e. of, from Mullett to 88 ft. n. of Chestnut	4	iron.
" alley e. of, from Waterloo to Preston	3	"
McGraw ave., from Sixteenth to Sullivan	4	"
" from Grand River to Twenty-sixth	4	"
" from La Salle to Scotten	4	"
McKinstry ave., from River to n. line of Toledo	6	"
McMillan st., w. from Junction 273 ft.	4	"
" crossing Livernois e. side	4	"
Mack ave., from Gratiot to Cadillac	6	"
" from Gratiot to Townsend	4	"
" from Townsend to Baldwin	6	"
" crossing Mt. Elliott	6	"
" w. from w. line of Helen 80 ft.	6	"

LOCATION.	DIAM. INCHES.	KIND.
Mack ave. , from Thorburn to Vandyke.....	8	Iron.
" from 75 ft. w. of La Ciede to 65 ft. e. of Crane.....	8	"
Macomb st. , from St. Antoine to Elmwood.....	4	"
" alley s. of, from Brush to alley w. of.....	3	"
" alley s. of, from Brush to St. Antoine.....	4	"
" alley n. of, from Brush to alley w. of.....	3	"
" alley n. of, from Brush to St. Antoine.....	4	"
Madison ave. , n. and s. sides, from Witherell to John R.....	4	"
" from Randolph to St. Antoine.....	4	"
" alley s. of, from John R. to Randolph.....	4	"
" alley n. of, from John R. to Randolph.....	4	"
Magnolia st. , from Harrison to Thirteenth.....	4	"
" from Thirteenth to Wabash.....	3	"
" from Thirteenth to Sullivan.....	3	"
" from Sullivan to Maybury.....	4	"
" crossing Humboldt and Twenty-fourth.....	4	"
" from Twenty-seventh to Vinewood.....	4	"
Mansur st. , from Harper to 78 ft. s. of Piquette.....	4	"
Maple st. , from Gratiot to Orleans.....	8	"
" from Orleans to St. Aubin.....	4	"
" from St. Aubin to Dubois.....	6	"
" crossing Dubois.....	8	"
" from Dubois to Elmwood.....	6	"
Marcy st. , w. from Fourth 158 ft.....	3	"
" from 158 ft. w. of Fourth to Crawford.....	4	"
Marietta st. , e. from McClellan 531 ft.....	4	"
Mark st. , w. from Twelfth 180 ft.....	4	"
Marston Court , from 16-in. main to e. line of Woodward.....	6	"
Martin pl. , from Woodward to John R.....	4	"
Maybury ave. , from Michigan to n. line of Ash.....	6	"
" from Ash to 34 ft. n. of G. T. Ry.....	8	"
" from 307 ft. s. of, to 173 ft. n. of Warren.....	8	"
" s. from Hudson 256 ft.....	8	"
Mechanic st. , from Brush to Beauvlen.....	4	"
Medbury ave. , from Woodward to 350 ft. e. of John R.....	4	"
" w. from St. Aubin 730 ft.....	3	"
" crossing St. Aubin.....	4	"
" w. from Dubois 146 ft.....	4	"
" from Chene to Jos. Campau.....	4	"
" w. from Collins 165 ft.....	4	"
" crossing Collins.....	6	"
" from Helen to Frontenac.....	4	"
Meldrum ave. , from Jefferson to Congress.....	42	"
" from Wight to 46 ft. n. of Fort.....	6	"
" from 46 ft. n. of Fort to 360 ft. n. of Kercheval.....	4	"
" from 360 ft. n. of, to 570 ft. n. of Kercheval.....	6	"
" from Arndt to Gratiot.....	6	"
Merrick ave. , from Cass to Third.....	4	"
" w. from Fourth 136 ft.....	4	"
" from 136 ft. w. of Fourth to e. line of Crawford.....	3	"
" from e. line of Crawford to Lincoln.....	4	"
" from Trumbull to Twelfth.....	4	"
" w. from Twelfth 214 ft.....	3	"
" from 214 ft. w. of Twelfth to Wabash.....	3	wood.
" from Tillman to Twenty-third.....	4	iron.
" from Twenty-seventh to Vinewood.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Miami ave., from Gratiot to Witherell.....	16	iron.
" n. side, from John R. to Witherell.....	4	"
" alley w. of, from Gratiot to alley s. of.....	6	"
" alley w. of, from Gratiot to Witherell.....	4	"
" alley e. of, from Gratiot to John R.....	4	"
Michigan ave., from Woodward to Cass.....	24	"
" from Washington to First.....	10	"
" from First to Twenty-fourth.....	8	"
" from Twenty-fourth to Livernols.....	6	"
" alley s. of, from Shelby to Cass.....	4	"
" alley n. of, from alley e. of Griswold to alley e. of Wash- ington.....	4	"
" alley n. of, from alley w. of Washington to alley w. of Cass.....	4	"
Military ave., from River to 250 ft. n. of Wabash R. R.....	6	"
" from 62 ft. n. of Anthon to 157 ft. n. of McMillan.....	6	"
Miller st., from Sixth to Seventh.....	3	"
" crossing Seventh.....	4	"
Milwaukee ave., from Beaubien to Green.....	6	"
" from Eighteenth to 36 ft. w. of Sullivan.....	4	"
" from Beaubien to w. line of Riopelle.....	4	"
" from Dubois to Jos. Campau.....	4	"
" crossing Collins.....	8	"
Minnie ave., from River to 642 ft. s. of Fort.....	6	"
" s. from Fort 642 ft.....	4	"
Mitchell ave, n. from Gratiot 265 ft.....	6	"
" from 265 ft. n. of Gratiot to Canfield.....	4	"
" from Canfield to Ferry.....	6	"
" from 34 ft. n. of Palmer to Harper.....	6	"
" n. from Harper 324 ft.....	4	"
" from Trombly to Griffin.....	4	"
Moeller st., e. from Russell 389 ft.....	4	"
Mohawk st., crossing Vinewood.....	4	"
Monroe ave., n. from Cadillac Square 51 ft.....	6	"
" from 51 ft. n. of Cadillac Square to Farmer.....	4	"
" from St. Antoine to Elmwood.....	4	"
" w. from Leib, 216 ft.....	4	"
" w. from Helen 185 ft.....	4	"
" from Crane to alley w. of.....	4	"
" alley s. of, from alley n. of Cadillac Square to Randolph... "	4	"
" alley n. of, from alley e. of Woodward to Farmer.....	4	"
" alley n. of, from Farmer to alley e. of Farrar.....	6	"
Montcalm st., w. from Woodward 412 ft.....	4	"
" from 412 ft. w. of Woodward to Cass.....	2	"
" from alley e. of Woodward to Brush.....	4	"
" from Brush to St. Antoine.....	2	"
" St. Antoine to Hastings.....	6	"
" from Hastings to Russell.....	2	"
" alley s. of, w. from Beaubien 240 feet.....	2 1/2	wood.
Monteith st., crossing Vinewood, e. side.....	4	from.
" w. from Twenty-seventh 116 ft.....	4	"
Moran st., from Gratiot to Dane.....	6	"
Morrell st., from River to s. line of Christianity.....	6	"
" from 345 ft. s. of Dix to Toledo.....	6	"
Mott st., from 16 in. main to e. line of Woodward.....	6	"
" e. from Woodward 528 ft.....	4	"
Mt. Elliott ave., from 148 ft. s. of Wight to 1,125 ft. s. of Waterloo.....	6	"
" from 1,125 ft. s. of Waterloo to Preston.....	8	"

LOCATION.	DIAM. INCHES.	KIND.
Mt. Elliott ave., from Preston to Mack.....	10	iron.
" " from Mack to Gratiot.....	8	"
" " from Gratiot to 300 ft. n. of Griffin.....	4	"
Mullett st., from Gratiot to Chene.....	30	"
" from St. Antoine to Elmwood.....	4	"
" w. from Crane 211 ft.....	4	"
Mulberry st., from Twelfth to Thirteenth.....	4	"
Myrtle st., from Grand River to Hubbard.....	6	"
Nall ave., crossing Vinewood.....	6	"
Napoleon st., from Brush to Russell.....	4	"
National ave., from 130 ft. s. of Lysander to 125 ft. n. of Putnam.....	6	"
Newark st., from Nineteenth to Twentieth.....	6	"
" e. from Foundry in Griffin's foundry.....	3	"
Nineteenth st., from Fort to Baker.....	4	"
" from Baker to Newark.....	6	"
Noble st., w. from Fourth 150 ft.....	3	"
" from 150 ft. w. of Fourth to Crawford.....	4	"
" from Sixth to Seventh.....	4	"
Norton st., e. from Junction 236 ft.....	4	"
" e. from Wesson 233 ft.....	4	"
Oakland ave., from 24 in. main to n. line of N. Boulevard.....	10	"
" from Horton to Hamlin.....	6	"
" crossing Harmon.....	10	"
Orchard st., from First to e. side of Elton Park.....	4	"
" from w. side of Elton Park to Sixth.....	4	"
" from Sixth to Trumbull.....	6	"
Orleans st., from Atwater to Jefferson.....	10	"
" from Jefferson to Reservoir grounds.....	8	"
" from Congress to Reservoir basin.....	24	"
" from Reservoir to Scott.....	30	"
" s. from Canfield 30 ft.....	30	"
" crossing Leland s. side.....	6	"
" from Alexandrine to Canfield.....	6	"
" n. from Garfield 352 ft.....	4	"
" from 232 ft. n. of Garfield to 195 ft. n. of Forest.....	6	"
" from Trombly to Lyman.....	4	"
Ottawa st., e from Thirteenth 130 ft.....	3	"
Owen ave., from 16 in. main to 1230 ft. e. of Woodward.....	6	"
Pallister ave., crossing Woodward.....	4	"
" from Woodward to Russell.....	3	wood.
" from Russell to 393 ft. e. of St. Aubin.....	6	iron.
" on n. line connecting 16-in. to 8-in. main in Woodward.....	8	"
Palmer ave., from Woodward to w. line of Brush farm.....	4	"
" crossing Russell and St. Aubin.....	4	"
" from 126 ft. w. of Dubois to e. line of Grandy.....	4	"
" crossing Collins.....	6	"
" w. from Vandyke 231 ft.....	4	"
Park pl., from Michigan to State.....	4	"
Park st., from Woodward to alley s. of Columbia.....	6	"
" from e. line of Woodward to Washington.....	16	"
" from Henry to Peterboro.....	4	"
Parsons st., from Woodward to Cass.....	4	"
Perry st., from Sixth to alley e. of Trumbull.....	4	"
" from alley w. of Trumbull to National.....	4	"
" alley s. of, from alley e. of Seventh to alley e. of Trumbull.....	4	"
Peterboro st., from Woodward to Cass.....	4	"
Pierce st., from Dequindre to Joe. Campau.....	4	"
Pine st., from Grand River to National.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Pine st., from National to Twelfth.....	3	iron.
" crossing Twelfth e. side.....	4	"
Pitcher st., from Cass to alley e. of Third.....	4	"
" w. from Fourth 150 ft.....	3	"
" from 150 ft. w. of Fourth to Crawford...	4	"
" from Sixth to Seventh.....	4	"
Pingree ave., from Woodward to Crawford.....	6	"
Piquette ave., from Woodward to Beaubien.....	4	"
" from Beaubien to Hastings.....	3	"
" from Hastings to Russell.....	4	"
" w. from Chene 406 ft.....	4	"
" crossing Collins.....	6	"
" e. from Moran 86 ft.....	4	"
" w. from Mt. Elliott 336 ft.....	4	"
" from Wabash to Fourteenth.....	4	"
" from Eighteenth to Sullivan.....	4	"
Pleasant ave., n. from River 515 ft.....	4	"
Plum st., from Second to alley e. of Trumbull.....	4	"
" from Trumbull to alley e. of.....	6	"
Plumer st., from 223 ft. e. of, to 185 ft. w. of Junction.....	4	"
" from Welch to Livernois.....	4	"
Poplar st., from 110 ft. e. of Wabash to Fourteenth.....	4	"
" crossing Thirteenth and Fifteenth.....	4	"
" from Tillman to 209 ft. w. of Twenty-third.....	4	"
" e. from Welch 82 ft.....	4	"
Porter st., w. from Twelfth 210 ft.....	3	"
" from 210 ft. w. of Twelfth to Thirteenth.....	4	"
" crossing Fourteenth.....	4	"
" e. from Fourteenth 173 ft.....	3	"
" from Eighteenth to alley w. of.....	4	"
" from alley w. of Eighteenth to Nineteenth.....	3	wood.
" from Twentieth to Twenty-first.....	3	iron.
" w. from Twenty-first 175 ft.....	3½	wood.
" from 175 ft. w. of Twenty-first to Twenty-second.....	3	iron.
" from Twenty-second to Twenty-third.....	4	"
" from Twenty-third to Twenty-fourth.....	3½	wood.
" from Twenty-fourth to e. line of W. Boulevard.....	4	iron.
" from e. line of W. Boulevard to Vinewood.....	6	"
" from Hubbard to Scotten.....	3	"
" from McKinstry to Ferdinand.....	4	"
" alley s. of, from Thirteenth to alley e. of.....	3	"
Prentiss ave., from Cass to Third.....	4	"
Preston st., from Gratiot to w. line of Elmwood.....	3	wood.
" from w. line of Elmwood to Mt. Elliott.....	4	iron.
Private st., n. of Ferry, crossing Rivard.....	4	"
" n. of Ferry, w. from Rivard 302 ft.....	3	"
Private way, e. of Russell, s. from Pallister 405 ft.....	4	"
Pulford ave., e. from Gratiot 315 ft.....	4	"
" w. from Mt. Elliott 161 ft.....	4	"
" from Meldrum to Beaufait.....	4	"
Putnam ave., w. from Woodward 60 ft.....	6	"
" from 60 ft. w. of Woodward to w. line of Cass.....	4	"
" from Fourth to Lincoln.....	4	"
" from Trumbull to Twelfth.....	4	"
" w. from Twelfth 185 ft.....	3	"
Randolph st., from alley s. of Atwater to Jefferson.....	4	"
" from Atwater to 24 in. main in Cadillac square.....	3	"
" from Larned to Congress.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Randolph st., from Congress to Adams.....	6	iron.
" crossing Gratiot.....	10	"
" alley w. of, n. from Atwater.....	8	"
" alley e. of, from alley s. of Fort to Champlain.....	4	"
" alley e. of, from alley n. of Monroe to Gratiot.....	4	"
Ranspach st., from Hammond to Livernois.....	4	"
Raynor st., from Clinton to Gratiot.....	4	"
Reed pl., w. from Fourth 86 ft.....	4	"
" from 86 ft. w. of Fourth to Crawford.....	8	"
" w. from Crawford 135 ft.....	4	"
Reeder ave., from Junction to 438 ft. w. of Campbell.....	4	"
Reservoir grounds, n. of basin to 80 in. branch.....	24	"
" s. and w. sides of basin.....	24	"
Rich st., e. from Vinewood 204 ft.....	4	"
" from Scotten to Twenty-eighth.....	4	"
Riopelle st., from Atwater to Jefferson.....	8	"
" from Jefferson to Larned.....	12	"
" from Larned to Adelaide.....	8	"
" from Adelaide to 218 ft. n. of Hancock.....	6	"
" alley e. of, s. from Canfield 218 ft.....	4	"
Rivard st., from Atwater to Jefferson.....	8	"
" from Larned to Congress.....	4	"
" from Jefferson to Clinton.....	10	"
" from Mullett to Gratiot.....	10	"
" from Gratiot to Watson.....	4	"
" from Eliot to Warren.....	4	"
" from Warren to Farnsworth.....	8	wood.
" from Farnsworth to 231 ft. n. of Palmer.....	4	iron.
" from 231 ft. to 261 ft. n. of Palmer.....	6	"
" crossing Piquette.....	4	"
" from alley n. of Boulevard to Pallister.....	4	"
" n. from Pallister 1,178 ft.....	6	"
River st., from Third to Fourth.....	4	"
" from Fifth to Sixth.....	4	"
" from Sixth to e. side M. C. R. R.....	8	"
" crossing M. C. R. R. tracks 270 ft.....	6	"
" from w. line of M. C. R. R. to 525 ft. w. of Twenty-fourth.....	8	"
" from Pleasant to Campau.....	8	"
" from Campau to main entrance of Exposition Grounds.....	6	"
" s. from main into Det. & L. S. Copper Works.....	4	"
Roby st., n. from Ferry 235 ft.....	4	"
Rohms ave., from Elm Grove to alley s. of Mack.....	6	"
Romeyn st., w. from Junction 274 ft.....	4	"
Rose st., from Eighteenth to Twentieth.....	4	"
Rosedale ave., from 16-in. main to e. line of Woodward.....	6	"
" from e. line of Woodward to w. line of Oakland.....	4	"
Rowena st., from Woodward to Riopelle.....	4	"
Rowland st., s. from State 187 ft.....	4	"
" n. from State 237 ft.....	6	"
Russell st., from Larned to Congress.....	6	"
" from Congress to Monroe.....	4	"
" from Mullett to Maple.....	8	"
" from Maple to Gratiot.....	4	"
" from Gratiot to Watson.....	8	"
" from Watson to Canfield.....	6	"
" from Canfield to s. line of Hendrie.....	10	"
" from s. line of Hendrie to s. line of Piquette.....	8	"
" from s. line of Piquette to Moeller.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Russell st., alley e. of, from Chase to Fort.....	2½	wood.
" alley e. of, n. from Willis 220 ft.....	4	iron.
Sargent st., crossing Collins.....	6	"
Savoy st., from Twenty-first to Twenty-second.....	4	"
" from Twenty-third to Twenty-fourth.....	4	"
Schiller st., e. from McClellan 245 ft.....	4	"
Schulte ave., from alley n. of Boulevard to Fallister.....	4	"
Scott st., from Orleans to Chene.....	30	"
" from Riopelle to e. line of St. Aubin.....	4	"
" from e. of St. Aubin to Dubois.....	3	"
" crossing Dubois and Chene.....	4	"
" e. from Dubois 190 ft.....	3	wood.
" from 190 ft. e. of Dubois to 490 ft. e. of Chene.....	3	iron.
" from 490 ft. e. of Chene to Jos. Campau.....	4	"
Scotton ave., from Fort to Dix.....	6	"
" from Dix to Buchanan.....	8	"
" from Buchanan to McGraw.....	6	"
Sears ave., from Holcomb to McClellan.....	4	"
Second st., from Front to alley n. of Jefferson.....	6	"
" from Jefferson to alley n. of.....	10	"
" crossing Congress.....	10	"
" from Abbott to alley s. of.....	8	"
Second st. and ave., from Abbott to Bagg.....	10	"
" ave., from High to 166 ft. n. of Henry.....	4	"
" from Bagg to 30 ft. n. of Prentiss.....	6	"
" crossing Canfield.....	8	"
" e. side from s. line of Forest to 184 ft. n. of.....	6	"
" e. side, crossing Hancock, Warren and Putnam.....	6	"
" e. side, crossing Merrick, Kirby and Holden.....	6	"
" w. side, crossing Hancock, Warren and Putnam.....	4	"
" w. side, crossing Merrick, Kirby and Holden.....	4	"
" s. from Holden 700 ft.....	3	wood.
" from Holden to 303 ft. n. of Milwaukee.....	6	iron.
" crossing N. Boulevard.....	8	"
" alley e. of, from alley n. of Canfield to Prentiss.....	4	"
Seiden ave., from Woodward to Third.....	4	"
" from Fourth to alley w. of.....	4	"
" from alley w. of Fourth to Crawford.....	2	"
" from Sixth to Seventh.....	4	"
Seventh st., from River to alley n. of Lafayette.....	8	"
" from alley n. of Lafayette to Bagg.....	10	"
" from Bagg to Grand River.....	8	"
" from Grand River to Brigham.....	6	"
" crossing Brigham.....	8	"
" from Brigham to 150 ft. n. of Lysander.....	2½	wood.
" from 150 ft. n. of Lysander to n. line of Putnam.....	6	iron.
" crossing Merrick.....	6	"
" from 214 ft. s. of Kirby to 339 ft. n. of Stanley.....	6	"
" alley w. of, from alley n. of Pine to Spruce.....	3	"
" alley w. of, from Perry to alley s. of.....	4	"
Seventeenth st., from Fort to 28 ft. s. of Poplar.....	6	"
" from 28 ft. s. of Poplar to Buchanan.....	4	"
" from Buchanan to 244 ft. n. of Hancock.....	6	"
" from 42 ft. n. of Merrick to Kirby.....	6	"
" s. from 24-in. main in N. Boulevard 62 ft.....	6	"
Shady lane, crossing W. Boulevard.....	4	"
" crossing Vinewood.....	6	"
Shelby st., w. side, Atwater to Woodbridge.....	3	"

LOCATION.	DIAM. INCHES.	KIND.
Shelby st., w. side, Woodbridge to Jefferson.....	4	iron.
“ e. side, Woodbridge to Jefferson.....	8	“
“ from Jefferson to Michigan.....	10	“
“ from Lafayette to alley s. of Michigan.....	4	“
Sheridan ave., from Jefferson to Kercheval.....	6	“
Sherman st., from Hastings to Elmwood.....	4	“
“ from Crane to alley w. of.....	4	“
Sibley st., from Woodward to Clifford.....	4	“
Sidney ave., from 16 in. main in Woodward to w. line of Oakland.....	6	“
Sixth st., from River to Congress.....	16	“
“ from Congress to Abbott.....	24	“
“ from River to alley n. of.....	4	“
“ from alley n. of Labrosse to Bagg.....	4	“
“ n. from Bagg 88 ft.....	8	“
“ from 88 ft. n. of Bagg to 473 ft. n. of Grand River.....	4	“
“ from 473 ft. n. of Grand River to Brigham.....	6	“
“ crossing Brigham.....	6 and 8	“
“ from Brigham to 265 ft. n. of Lysander.....	4	“
Sixteenth st., from Lafayette to Myrtle.....	6	“
“ from Myrtle to Buchanan.....	8	“
“ from Buchanan to Grand River.....	10	“
“ from Grand River to McGraw.....	6	“
“ s. from 24 in. main in N. Boulevard 63 ft.....	8	“
“ alley w. of, from Lafayette to Howard.....	3	“
Smith ave., from Woodward to Oakland.....	4	“
South st., from Grand River to Noble.....	4	“
Southern ave., e from Liversoll 153 ft.....	4	“
Spencer st., from Cass to Second.....	4	“
Sproat st., from Woodward to Cass.....	4	“
Spruce st., from Fifth to alley w. of Seventh.....	4	“
“ from alley w. of Trumbull to National.....	4	“
“ from Harrison to Twelfth.....	4	“
“ alley s. of, from alley w. of Seventh to alley e. of Trumbull..	3	“
St. Albertus pl., from 22 ft. e. of Dequindre to 260 ft. w. of St. Aubin.....	4	“
“ w. from St. Aubin 260 ft.....	3	“
St. Antoine st., from Atwater to Congress.....	8	“
“ from Jefferson to Congress.....	4	“
“ from Congress to Gratiot.....	6	“
“ crossing Champlain.....	8	“
“ from Gratiot to Elizabeth.....	4	“
“ from Elizabeth to Adelaide.....	6	“
“ from Adelaide to Watson.....	8	“
“ from Watson to Farnsworth.....	6	“
“ crossing Frederick.....	6	“
“ n. from Piquette 445 ft.....	6	“
“ from 150 ft. s. of Milwaukee to 4 in. in N. Boulevard.....	6	“
“ crossing N. Boulevard.....	8	“
St. Aubin ave., from Atwater to Harper.....	6	“
“ crossing Trombly.....	6	“
“ from Pallister to 75 ft. n. of Vulca.....	6	“
“ from Congress to Champlain.....	26	“
“ from Larned to Congress.....	12	“
“ crossing N. Boulevard.....	10	“
“ alley w. of, s. from Ferry 266 ft.....	2 1/4	wood.
St. Clair pl., from Nineteenth to alley w. of Eighteenth.....	4	iron.
St. Joseph st., from Russell to Riopelle.....	8	“
“ from e. line of Riopelle to 310 ft. e. of St. Aubin.....	4	“
“ from 310 ft. e. of St. Aubin to 202 ft. e. of Chene.....	3	“

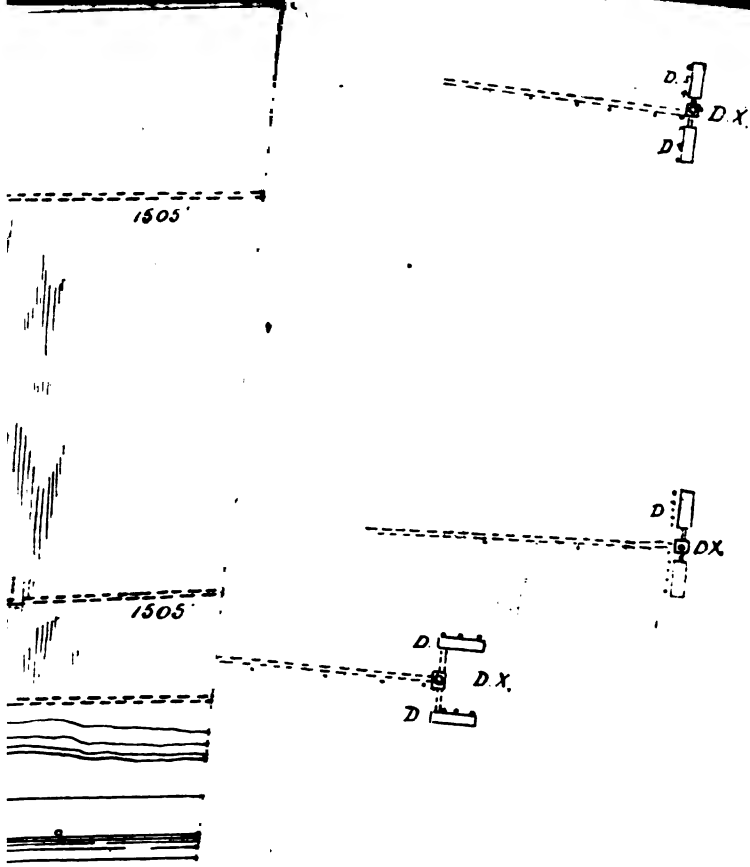
LOCATION.	DIAM. INCHES.	KIND.
St. Joseph st., from 302 ft. e. of Chene to Grandy.....	4	iron.
" from Grandy to Joseph Campau.....	2 1/4	wood.
" from w. line of McDougall to 438 ft. e. of.....	3 & 4	iron.
St. Paul ave., from Bellevue to e. line of Concord.....	4	"
" from w. line of E. Boulevard to e. line of Field.....	4	"
" from Townsend to Baldwin.....	4	"
" from Crane to alley w. of.....	4	"
Standish st., from Twentieth to Foundry.....	6	"
Stanley ave., from Seventh to w. line of Trumbull.....	4	"
" w. from Twelfth 183 ft.....	4	"
Stark ave., from Welch to Livernois.....	4	"
State st., from Woodward to Washington.....	30	"
" from Woodward to Washington.....	10	"
" w. of branch in Washington 34 ft.....	24	"
Stimson pl., from Woodward to Cass.....	4	"
Sullivan ave., from Michigan to 270 ft. n. of Linden.....	6	"
" s. from Buchanan 268 ft.....	6	"
" n. from McGraw 61 ft.....	6	"
" from 104 ft. s. of Piquette to 250 ft. n. of Wreford.....	6	"
" from s. to n. line of N. Boulevard.....	8	"
Summit ave., from River to Wabash R. R.....	6	"
Superior st., w. from Beaubien 220 ft.....	4	"
" from Beaubien to Hastings.....	2 1/4	wood.
" crossing St. Antoine and Hastings.....	4	iron.
" e. from Hastings 326 ft.....	3	wood.
" crossing Russell and Riopelle.....	4	iron.
" w. from Rivard 437 ft.....	4	"
" from Rivard to Russell.....	2 1/4	wood.
" from Riopelle to Dequindre.....	4	iron.
" from Dequindre to St. Aubin.....	2 1/4	wood.
" crossing St. Aubin and Chene.....	4	iron.
" from St. Aubin to 243 ft. e. of Chene.....	3	"
" from 197 ft. w. of Grandy to Mitchell.....	4	"
" from McDougall to Gratiot.....	4	"
Swain ave., from 40 ft. s. of Wabash R. R. to Fort.....	6	"
Sycamore st., w. from Grand River 123 ft.....	6	"
" from alley w. of Trumbull to National.....	4	"
" from Harrison to Wabash.....	4	"
Sylvester st., from Gratiot to Mt. Elliott.....	4	"
" from Beaufait to Bellevue.....	4	"
Tenth st., from River to Baker.....	8	"
" from Baker to Michigan.....	6	"
Theodore st., e. from John R. 403 ft.....	4	"
" from 226 ft. w. of Beaubien to 106 ft. e. of Riopelle.....	4	"
" from 226 ft. w. of St. Aubin to Grandy.....	4	"
" crossing Collins.....	6	"
" from Mt. Elliott to w. line of Beaufait.....	4	"
Third st., from Front to s. line of River.....	6	"
" from s. line of River to Larned.....	8	"
" from Larned to alley n. of.....	6	"
" from Larned to Fort.....	24	"
" from alley s. of Porter to Michigan.....	3	"
" from Michigan to Grand River.....	4	"
Third ave., from Grand River to Bagge.....	8	"
" from Bagge to Holden.....	6	"
" crossing Brigham.....	8	"
" from Brigham to Canfield.....	30	"
" alley e. of, from Henry to Brainard.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Thirteenth st., from Porter to 112 ft. n. of Elm.....	6	iron.
" crossing Myrtle	6	"
" from Magnolia to Grand River.....	6	"
" n. from Grand River 499 ft	4	"
" s. from Hancock 80 ft	6	"
" n. from Hancock 150 ft.....	4	"
" from 150 ft. n. of Hancock to n. line of Warren	6	"
" alley e. of, s from Porter 121 ft	4	"
Thirty-first st., from Michigan to 386 ft. s. of Warren	6	"
Thirty-second st., from Michigan to 87 ft. n. of Buchanan.....	6	"
Thirty-third st., from Michigan to 462 ft. n. of Buchanan	6	"
Thorburn ave., s. from Mack 684 ft	6	"
Tillman ave., from Michigan to Breckenridge.....	6	"
" s. from Warren 196 ft	6	"
" s. from Merrick (on the w.) 360 ft.....	6	"
Toledo ave., from 360 ft. e. of Scotten to McKinstry	4	"
" from McKinstry to Junction.....	6	"
" from 17 ft. e. of Campbell to Livernols.....	6	"
Townsend ave., from Jefferson to Kercheval.....	6	"
" n. from Mack 308 ft	6	"
" from 308 ft. n. of Mack to s. line of Gratiot	4	"
" from s. line to 8-in. main in Gratiot	8	"
Trombly ave., from Crystal to 7 ft. e. of St. Aubin	4	"
" from Chene to Ellery	4	"
" crossing Collins	6	"
Trowbridge ave., from 16-in. main to e. line of Woodward.....	6	"
" e. from Woodward 511 ft	4	"
Trumbull ave., from Abbott to alley s. of	10	"
" n. from Abbott 30 ft	6	"
" from Michigan to Plum	6	"
" from Grand River to alley n. of	6	"
" from Brigham to Forest	8	"
" from Forest to 497 ft. n. of G. T. Ry.....	6	"
" from 50 ft. n. of Piquette to Holden	6	"
" alley e. of, from Plum to Sycamore.....	6	"
" alley w. of, from Cherry to Pine.....	3	"
" alley w. of, from Pine to Myrtle.....	4	"
" alley w. of, from alley n. of Grand River to Brigham	6	"
Tuscola st., alley s. of, from alley w. of Fourth to Crawford.....	4	"
" alley n. of, from alley w. of Fourth to Crawford.....	4	"
Twelfth st., from 458 ft. s. of River to Lafayette.....	4	"
" from Howard to Baker.....	4	"
" from Baker to Brigham.....	6	"
" from Brigham to s. line of N. Boulevard.....	8	"
" from s. line of N. Boulevard to 24 in. main.....	10	"
Twentieth st., from Fort to Michigan	6	"
" alley e. of, s from Rose 197 ft.....	3	"
Twenty-first st., from Fort to Standish	4	"
Twenty-second st., from Fort to Dalselle	6	"
Twenty-third st., from Fort to 330 ft. n. of Porter	4	"
" from 330 ft. n. of Porter to 419 ft. n. of Dalselle	3	"
" crossing Baker	4	"
" n. from M. C. R. R. 259 ft	3	"
" from 259 ft. n. of M. C. R. R. to Magnolia.....	6	"
" from Magnolia to 35 ft. n. of Linden.....	3	"
" from 35 ft. n. of Linden to L. S. R. R.....	4	"
" from Buchanan to 150 ft. n. of Hancock	6	"
" s. from Warren 235 ft.....	6	"

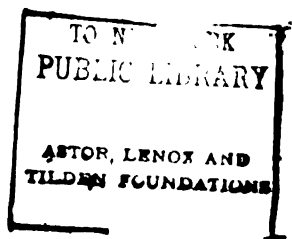
LOCATION.	DIAM. INCHES.	KIND.
Twenty-third st., from Merrick to Kirby.....	6	iron.
" " from Kirby to McGraw.....	4	"
Twenty-fourth st., from River to Fort.....	4	"
" " from Fort to Baker.....	6	"
" " from Baker to 30 ft. n. of Michigan.....	8	"
" " from 30 ft. n. of, to 54 ft. n. of Michigan.....	12	"
" " from 54 ft. n. of, to 96 ft. n. of Michigan.....	16	"
" " from 96 ft. n. of, to 181 ft. n. of Michigan.....	18	"
" " from 181 ft. n. of, to 236 ft. n. of Michigan.....	30	"
" " from 236 ft. n. of Michigan to Butternut.....	24	"
" " from Butternut to Buchanan.....	10	"
" " from Buchanan to McGraw.....	8	"
Twenty-fifth st., from Howard to Baker.....	4	"
" " from Baker to 100 ft. s. of Toledo.....	6	"
" " from E st. to Michigan.....	4	"
" " from Michigan to Linden.....	6	"
" " n. from Linden 192 ft.....	3	"
" " from 565 ft. s. of, to 165 ft. n. of Buchanan.....	6	"
" " s. from Hancock 399 ft.....	6	"
Twenty-sixth st., from 50 ft. s. of E st. to Buchanan.....	6	"
" " from 410 ft. s. of Kirby to McGraw.....	6	"
Twenty-seventh st., from Dix to 327 ft. s. of Toledo.....	6	"
" " from Michigan to Monteith.....	6	"
" " from Merrick to Hudson.....	6	"
Twenty-eighth st., from Michigan to 127 ft. n. of Kinsman.....	6	"
Twenty-ninth st., from 565 ft. s. of Michigan to Buchanan.....	6	"
Union st., from Fourth to Fifth.....	3	"
Uthes ave., from Clark to McKinstry.....	4	"
Van Dyke ave., from Jefferson to 150 ft. n. of Waterloo.....	8	"
" " from Mack to Gratiot.....	8	"
" " from Gratiot to a line of Centre-line road.....	6	"
Vine st., from Fourth to Fifth.....	3	"
Vinewood ave., from Fort to Buchanan.....	24	"
" " from Fort to 420 ft. n. of Toledo.....	6	"
" " from F to Buchanan.....	6	"
" " from Buchanan to Merrick.....	10	"
" " s. from Grand River 300 ft.....	6	"
Vingar st., from Vinewood to La Salle.....	6	"
Volunteer ave., w. from Junction 315 ft.....	4	"
Wabash ave., from n. line of M. C. R. R. to Ottawa.....	6	"
" " from Ottawa to Grand River.....	4	"
" " from Grand River to a line of L. S. R. R.....	24	wood
" " from a line of L. S. R. R. to 186 ft. n. of Piquette.....	6	iron.
" " crossing Warren.....	6	"
" " s. from 24-in. main in N. Boulevard 63 ft.....	6	"
" " alley e. of, from 136 ft. s. of Butternut to Myrtle.....	24	wood
" " alley east of, crossing Myrtle.....	4	iron
Walker st., from Atwater to Jefferson.....	4	"
Warren ave., from w. line of Cass to 105 ft. e. of Ropelle.....	4	"
" " from St. Aubin to 117 ft. w. of Chene.....	4	"
" " from 158 ft. w. of, to e. line of Grandy.....	4	"
" " crossing Collins.....	6	"
" " from Second to Third.....	4	"
" " from Fourth to Crawford.....	24	wood
" " from Crawford to 106 ft. w. of Seventh.....	4	iron.
" " from National to alley w. of Wabash.....	4	"
" " from Fourteenth to Sixteenth.....	4	"
" " from w. line of Sullivan to w. line of Twenty-fourth.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Warren ave., from 160 ft. e. of, to w. line of Vinewood.....	6	iron
Washington ave., from Michigan to State.....	30	"
" from Michigan to Park.....	10	"
" alley e. of, from alley n. of Michigan to alley s. of Park..	4	"
" alley w. of, from alley n. of Michigan to alley s. of Park,	4	"
Waterloo st., from Dequindre to Jos. Campau.....	4	"
" from alley e. of McDougall to Elmwood.....	4	"
" e. from Elmwood 563 ft.....	3	"
" from 563 ft. e. of Elmwood to w. line of Burlage pl.....	4	"
" from Mt. Elliott to 87 ft. e. of Beaufait.....	4	"
Watson st., from Woodward to Brush.....	4	"
" from Brush to Reservoir.....	24	"
" from Dequindre to Chene.....	2 1/4	wood.
" crossing St. Aubin, Dubois and Chene.....	4	iron.
Wayne st., s. from Woodbridge 173 ft.....	4	"
" from Woodbridge to Michigan.....	6	"
Webster pl., e. from Nineteenth 276 ft.....	4	"
" e. from Twenty-second 240 ft.....	2 1/4	wood.
Welch ave., from Plumer to s. line of M. C. R. R.....	6	iron.
" from 211 ft. s. of, to 235 ft. n. of Stark.....	6	"
" from Ingersoll to n. line of city limits.....	6	"
Wemson ave., from Toledo to L. S. R. R.....	6	"
" from n. line of G. T. Ry. to Leavitt.....	6	"
" from Det. L. and N. R. R. to 190 ft. n. of Herbert.....	6	"
Westminster ave., from 16-in. main to 290 ft. e. of Woodward.....	6	"
Whitaker ave., e. from Russell 731 ft.....	4	"
Widman pl., n. from Harper 160 ft.....	6	"
Wight st., from Chene to Leib.....	4	"
" from Leib to 110 ft. e. of Meldrum.....	6	"
" alley s. of, e. from McDougall 230 ft.....	4	"
Wilcox st., from Woodward to Miami.....	12	"
Wilkins ave., from 16-in. main to w. line of Woodward.....	6	"
" from w. line of Woodward to e. line of Auburndale.....	4	"
Wilkins st., from Brush to Russell.....	4	"
" from 156 ft. w. of Rlopelle to Dequindre.....	4	"
" e. from Dequindre 540 ft.....	2 1/4	wood.
" from 540 ft. e. of Dequindre to e. line of St. Aubin.....	4	iron.
" from St. Aubin to 235 ft. e. of Dubois.....	3	wood.
" crossing Dubois and Chene.....	4	iron.
" w. from Chene 373 ft.....	2 1/4	wood
Williams ave., from Michigan to 196 ft. n. of Breckenridge.....	6	iron.
" from n. line of Merrick to Hudson.....	6	"
Williams rd., from 16-in. main to w. line of Woodward.....	6	"
Willis ave., from Woodward to Beaubien.....	4	"
" from Beaubien to St. Antoine.....	3	"
" from St. Antoine to Hastings.....	2 1/4	wood.
" e. from Hastings 356 ft.....	4	iron.
" from 356 ft. e. of Hastings to Rivard.....	3	"
" from Rivard to Russell.....	3	wood.
" from w. line of Russell to Dequindre.....	4	iron.
" from e. line of Dequindre to 80 ft. e. of Dubois.....	2 1/4	wood.
" crossing St. Aubin and Chene.....	4	iron.
" from 80 ft. e. of Dubois to Grandy.....	3	"
" from Jos. Campau to McDougall.....	2 1/4	wood.
" crossing Mitchell.....	4	iron.
" from w. line of, to 291 ft. e. of McDougall.....	4	"
" e. from Collins 146 ft.....	4	"
" from Woodward to Third.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Willis ave., from Fourth to Crawford	4	iron.
" from Sixth to Eighth	4	"
" e. from Twelfth 215 ft.	3	wood.
" crossing Twelfth	4	iron.
Winder st., from Woodward to Orleans	4	"
Wing pl., from Nineteenth to alley w. of Eighteenth	4	"
Winalow ave., n. from Grand River 85 ft.	4	"
Winter st., e. from Dequindre 431 ft.	4	"
Witherell st., from e. line of Woodward to Miami	16	"
" from Woodward to Miami	6	"
" from Miami to Adams	4	"
" from Adams to alley n. of	2	"
Wolff st., e. from Scotten 357 ft.	4	"
Woodbridge st., from Randolph to Brush	4	"
" e. from St. Antoine 280 ft.	3	"
" from St. Antoine to Rivard	4	"
" from Rivard to Russell	3	"
" from Russell to Orleans	4	"
" from Orleans to Dubois	6	"
" w. from Jos. Campau 300 ft.	3 1/4	wood.
" e. from Jos. Campau 400 ft.	4	iron.
" crossing Leib w. side 34 ft.	4	"
" w. from Leib 300 ft.	3 1/4	wood.
" alley s. of, from Bates to Randolph	4	iron.
" alley s. of, from Brush to 210 ft. e. of Beaubien	3	"
" crossing Woodward	8	"
" from Woodward to Griswold	6	"
" from Griswold to First	4	"
" from First to Second	6	"
Woodland ave., from 16 in. main to e. line of Woodward	6	"
" e. from Woodward 780 ft.	4	"
Woodward ave., from Atwater to Jefferson	16	"
" e. side, s. from Atwater 246 ft.	3	"
" w. side, s. from Atwater 171 ft.	4	"
" from Jefferson to Soldiers' Monument	24	"
" from Atwater to Adams	8	"
" from Adams to Baltimore	10	"
" from Baltimore to Pallister	8	"
" from N. Boulevard to Woodland	16	"
" from High to 200 ft. n. of Canfield	4	"
" from Bagg to Edmund pl.	24	"
" alley e. of, from alley s. of Atwater to alley s. of Jefferson	4	"
" alley e. of, from alley n. of Jefferson to alley n. of Congress	4	"
" alley e. of, from Gratiot to alley s. of	6	"
" alley e. of, from Gratiot to alley s. of Witherell	4	"
" alley e. of, from Elizabeth to alley s. of	3	"
" alley e. of, crossing Elizabeth	4	"
" alley e. of, from Columbia to Montcalm	4	"
" alley w. of, from Atwater to alley s. of Jefferson	4	"
" alley w. of, from n. of Jefferson to Larned	4	"
" alley w. of, from Larned to Congress	8	"
" alley w. of, from Congress to alley n. of	4	"
" alley w. of, from alley n. of Michigan to alley s. of Park	4	"
" alley w. of, from Montcalm to High	4	"
Woodward ave. terrace, from Woodward to John R.	4	"
Wreford ave., from Grand River to 95 ft. e. of Sullivan	4	"
Zender pl. w. from Mt. Elliott 354 ft.	4	"



- .. Coal Sheds.
- A. Upper and Lower 42-inch Mains.
- 1. 30-inch Main to Stand-Pipe.
- 1. Stand-Pipe and Tower.
- 1. 42-inch Main Gate.
- 1. 24-inch Blow-off.
- 1. Old Gate and Strainer Houses.
- 1. Main Dock and Dividing Wall.
- 1. Swing Bridge.
- 1. Driveways.
- 1. Engineer's House.
- 1. East and West Lakes.
- 1. Canal.
- 1. Coal Hoist and Tramways.
- 1. Unfinished Grounds.







Deep

al

FORTY-FIRST

JANUARY

REPORT

OF THE

BOARD

BOARD OF WATER COMMISSIONERS



NEW WATER WORKS.

TO THE

COMMON COUNCIL OF THE CITY OF DETROIT

FOR THE YEAR

1892.

VILA



FORTY-FIRST ANNUAL REPORT

OF THE

Board of Water Commissioners

TO THE

COMMON COUNCIL OF THE CITY OF DETROIT

TOGETHER WITH THE

REPORTS OF THE OFFICERS OF THE BOARD

FOR THE YEAR 1892.

DETROIT:

THE DETROIT FREE PRESS PRINTING COMPANY.

1893.



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BOARD OF WATER COMMISSIONERS.

DETROIT, 1892.

MEMBERS:

JOSEPH L. HUDSON, 1892. AUGUST GOEBEL, 1894.
SAMUEL G. CASKEY, 1893. HENRY M. DUFFIELD, 1895.
FRANK E. KIRBY, 1896.

COMMITTEES:

WAYS AND MEANS.....	Commissioners	DUFFIELD, HUDSON.
EXTENSION AND CONSTRUCTION.	Commissioners	HUDSON, KIRBY.
PUMPING WORKS.....	Commissioners	KIRBY, GOEBEL.
SUPPLIES.....	Commissioners	GOEBEL, DUFFIELD.

OFFICERS:

PRESIDENT.....	SAMUEL G. CASKEY.
VICE-PRESIDENT.....	AUGUST GOEBEL.
SECRETARY.....	L. N. CASE.
SUPT. OF EXTENSION AND CONSTRUCTION...	HENRY BRIDGE.
SUPT. OF METERS AND INSPECTION.....	THOMAS R. PUTNAM.
SUPT. OF GROUNDS.....	E. A. SCRIBNER.
CHIEF ENGINEER, ACTING.....	URIAH GOULD.
“ “ CONSULTING.....	JOHN E. EDWARDS.
METER CLERK.....	HARRY S. STARKEY.
	MAX F. GREUNER.
	ALBERT W. GOODSSELL.
	ANTHONY T. McLOGAN.
ASSESSORS AND COLLECTORS.....	FRED. H. HUTAFF.
	HARRY L. JAMES.
	AUGUST GOEBEL, JR.
	JOHN ROBINSON.
	PETER BECKER.
RECEIVING CLERK.....	GEORGE E. KUNZE.
PERMIT CLERK.....	AUGUST KUENZEL.

DETROIT WATER WORKS.

METER RATES.

First 3,000 Cubic feet, each month, each 100 gallons.....	¾ of a cent.
All over, each 100 gallons.....	½ of a cent.

ASSESSMENT RATES.

FROM JULY 1st, 1886.

	PER ANNUM
For Family, household purposes.....	\$3 00
Green Houses.—Special rates.	
Private Stables, for each horse.....	2 00
Livery Stables, " " ".....	2 00
Dray and Team Horses, each.....	1 00
Cows, each.....	1 00
Stores and Offices,.....	\$2 00 to 30 00
Bakeries, average daily use, for each barrel of flour.....	3 50
Saloons, Groceries and Provision Stores, from.....	\$3 00 to 100 00
Bar, with faucet, from.....	8 00 to 50 00
Fish Houses.....	10 00 to 100 00
Slaughter Houses.—Special rates.	
Hotels and Taverns, in addition to family rate, each room.....	1 00
Boarding Schools, each room.....	1 00
Public Schools, from.....	\$5 00 to 50 00
Building Purposes, each 1 M brick.....	5
" " " 100 yards plastering.....	10
" " " perch stone.....	1½
Printing Offices.—Special rates.	
Butcher Stalls, each not less than.....	3 00
Workshops, for 10 persons or under.....	3 00
" " for each additional 10 persons.....	1 00
Estimated quantities of water each 100 gallons.....	2
Boarding Houses, in addition to family rate, each boarder.....	1 00

FIXTURES.

Bath Tubs, for families, 1st tub, \$2; each additional.....	\$1 00
Bath Tubs, public, each tub.....	5 00
Water-closets, for a family, 1st closet, \$3 00; each additional, \$2 00.....	\$3 00 to 15 00
Water-closets, for Hotels, Stores, Factories, etc., for 10 persons, \$5 00; each additional person.....	25
Hot Water-closets, not less than.....	6 00
Urinals, not less than.....	2 00
Wash-Hand Basins, for family.....	\$1 00 to 3 00
" " " for other purposes, each person.....	25
Permanent Wash Tubs.....	2 00
Hose, for lawn and street sprinkling purposes.....	free.
Hose, for other purposes.....	\$3 00 to 20 00
Fountains.....	5 00 to 20 00
Street Sprinklers, each wagon ..	120 00

Where there is a waste of water a proper increase of rates will be made.

REPORT
OF THE
BOARD OF WATER COMMISSIONERS
OF THE
CITY OF DETROIT.

WATER COMMISSIONERS' OFFICE.

DETROIT, January —, 1893.

To the Common Council of the City of Detroit :

The Board of Water Commissioners respectfully submits its annual report for the year ending December 31, 1892.

Accompanying this report to your honorable body, are the reports of the Secretary, upon the general management and financial transactions of the Board, and of the several heads of departments, to which your careful attention is respectfully invited.

Our fellow-citizens will be pleased to learn that the long and vexatious litigations growing out of the Hurlbut will, have at last come to a conclusion. The Board will soon be in the position to improve considerably the Water Works park, as it will be remembered that the income from this entire legacy is to be used to beautify the said grounds and for no other purpose.

On the first day of August next, water bonds to the amount of \$146,000 will become due and payable. There will be in the sinking fund at that time something over \$75,000. It will be necessary, therefore, to make up the difference of \$71,000, either from the general fund or by the issuance of new bonds. The Secretary has estimated that at that time there will be in

the general fund, at least \$75,000, which we believe to be correct, and it is the unanimous opinion of the members of this Board that the interests of the city affected, would be best conserved by the payment of this balance from this fund.

The building of an additional engine and the necessary construction for its operation have already commenced, and will be completed by the first of July. It will be seen by the Engineer's report, that it was not increased consumption that required this construction, as the quantity pumped in 1892 was considerably less than that of 1887, five years ago.

The unusual and unexpected demand for water during the protracted heat and drouth of July and August practically exhausted the pumping capacity of the Works, and forced this step upon the attention of the Board. The possibility of its recurrence made it necessary to provide for such a contingency, and for this reason only is the new engine being purchased.

We feel that we have reason to congratulate ourselves upon the condition of the Works at this time, and upon the changes or innovations introduced in its operation. The establishment of an oil plant by which there is an annual saving of over \$12,000 in the cost of fuel could not have happened more opportunely, as the condition of the natural gas supply would have forced us months ago to resort again to the use of coal, which at the present prices would have made our expense for pumping water over \$18,000 more than it now costs with oil.

The thorough efficiency of the Works, and an economical administration of its affairs, we have aimed to accomplish. And when we consider that the operating expenses of 1892 were \$2,000 less than those of 1888, notwithstanding that the population has increased 50,000, with all the accompanying mechanical and industrial pursuits that have been established during this time, we certainly feel a just pride in the results which the introduction of remedial measures have produced.

The efficiency of the Works has also been improved in various particulars, especially that of equalizing the head of water throughout the city to such an extent as to cause complaints of a short or insufficient supply to almost entirely cease.

We are also gratified to state that under arrangements entered into with the Board of Public Works at the beginning of the year, harmony has prevailed in our relationship with that Board, and we desire to add further that, with all the other departments of our municipal government, the conduct of mutual affairs has been most pleasant and influenced simply to the accomplishment of the public good.

All of which is respectfully submitted.

SAMUEL G. CASKEY,
AUGUST GOEBEL,
HENRY M. DUFFIELD,
J. L. HUDSON,
FRANK E. KIRBY,

Commissioners.

REPORT OF THE SECRETARY.

DETROIT, January 2d, 1893.

To the Board of Water Commissioners:

GENTLEMEN,—I have the honor to present herewith my report of the general transactions and operations of the Works for the past year, together with a detailed statement of the financial affairs of the Board.

Probably the most important operation of the Board has been, for the last four years, and is to-day, its determined efforts to

REDUCE THE WASTE OF WATER.

It is an established fact the world over, that the consumption of water increases much more rapidly than the population, where no means are in use to keep a record individually of such consumption.

Various reasons, other than the true one, are often given for this increased consumption. A certain portion of this increase is often ascribed to the growth of the manufacturing and business interests of a community; but when it is considered that if a certain business interest will provide support for ten families and that the establishment of a similar interest will provide for ten additional families, it seems to be a fact that the *pro rata* of families in their relationship to business must necessarily remain the same, and that some other cause must be sought for.

In establishing and illustrating certain facts, I am obliged to have recourse to tabular statements, and although figures must necessarily be dry and uninteresting, yet I earnestly invite careful attention to the tables herewith introduced.

To illustrate the rapid growth in the consumption of water from year to year, I have prepared the following table, showing

the number of families supplied, the total quantity of water pumped, and the *pro rata* quantity for each family in each year during the entire time that the Works have been under a Commission and a record kept :

YEARS.	FAMILIES SUPPLIED.	WATER PUMPED.		REMARKS.
		TOTAL QUANTITY.	PER FAMILY.	
1852..	.....	235,840,375	.....
1853..	4,288	308,531,743	70,868	
1854..	4,619	376,265,126	81,460	
1855..	5,282	542,807,364	102,765	
1856..	5,706	692,124,305	121,297	
1857..	6,189	697,190,523	112,650	
1858..	6,474	718,091,207	110,919	
1859..	6,794	782,112,587	115,118	
1860..	6,750	870,036,451	125,185	
1861..	7,128	895,129,423	125,579	
1862..	7,275	994,945,329	136,762	
1863..	7,699	1,035,798,043	134,584	
1864..	7,993	1,019,890,256	127,410	
1865..	8,351	1,040,514,887	125,675	
1866..	9,069	1,196,317,922	131,622	
1867..	10,242	1,425,535,230	139,186	Average per cent. of increase from 1852 to 1866— 12.86.
1868..	11,544	1,666,545,125	144,364	
1869..	12,774	1,946,810,325	152,400	
1870..	13,722	1,866,060,068	136,000	
1871..	14,896	2,300,150,605	154,414	
1872..	16,035	2,782,292,578	173,513	
1873..	17,019	3,198,393,948	187,990	
1874..	18,853	3,289,872,635	174,511	
1875..	19,608	4,207,454,260	214,600	
1876..	20,102	4,065,134,470	202,225	
1877..	20,345	4,218,239,790	207,090	
1878..	20,603	4,845,743,330	210,927	
1879..	21,341	5,129,599,110	240,348	
1880..	22,465	5,552,965,310	247,183	Average per cent of increase from 1879 to 1888, in- clusive, 8.5.
1881..	23,749	6,543,127,968	279,722	
1882..	25,442	6,284,000,742	243,062	
1883..	27,415	7,379,327,788	269,170	
1884..	29,424	8,510,614,140	289,260	
1885..	30,533	9,970,829,580	326,886	
1886..	31,946	10,576,571,254	331,070	
1887..	34,486	13,168,859,808	381,960	
1888..	36,863	14,880,166,670	390,098	
1889..	39,158	12,875,334,453	328,880	Commenced Metering.
1890..	41,467	12,120,944,532	292,300	Average per cent. of decrease since 1888, 11½.
1891..	43,983	12,057,261,236	274,470	
1892..	46,400	12,276,612,482	264,582	

A glance at the right hand column will give the fact that the *pro rata* quantity for each family supplied, increased from 70,000 gallons in 1853 to 390,000 in 1888, an average annual increase of 12.86 per cent., and an average increase during the ten years previous to 1888 of 8.5 per cent.

In consideration of the fact that in London, Eng., where waste is reduced to a minimum but about 55,000 gallons is the *pro rata* per family per annum, and in Providence, where meters are almost in general use, the *pro rata* is less than 75,000, I cannot but believe that this column of figures, with its broad base of 390,000 gallons in 1888, is but a monument to the ever-growing habit of wastefulness in man, and that the figures thereafter, with those of 1888 as a base, form another column which is fast becoming a monument to the efficiency of the meter system.

COST OF PUMPING WATER.

For the purpose of proving that the average cost of pumping one million gallons of water has been, with the use of coal, \$4.45, I have prepared a table giving the exact expenses each year for the past ten years :

YEARS.	NO. OF GALLONS PUMPED.	TOTAL ANNUAL EXPENSE.	COST PER MILLION.	REMARKS.
1888..	7,379,827,188	\$30,678 72	\$4 15	
1884..	8,510,614,140	33,172 81	3 78	
1885..	9,970,829,580	35,531 53	3 56	
1886..	10,576,571,254	36,628 19	3 46	
1887..	13,168,859,808	57,352 94	4 35	Pressure increased.
1888..	14,380,166,670	60,284 11	4 19	
1889..	12,875,334,453	61,560 48	4 82	
1890..	12,120,944,533	54,448 49	4 49	
1891..	12,057,261,236	53,012 77	4 39	Rate reduced by use of oil Nov. and Dec.
1892..	12,276,612,482	53,287 39	4 27	

Previous to 1887 the average cost was less, but that year and since, with certain variations due almost entirely to the character of the coal purchased, the average cost previous to 1892 has been \$4.45. This increase is due to the fact that in 1887 the

Reservoir was abandoned and the pressure materially increased throughout the city.

INTRODUCTION OF METERS.

In the spring of 1889, the placing of meters was commenced and has been steadily and systematically continued until, at the close of the year, all, practically, of the manufacturing and business interests of the city are so supplied. The causes that led to this step and some of the results therefrom have been fully discussed in my previous reports.

I desire, however, to reprint a table that appears in my report of 1890. To me it is a convincing argument of itself, for the use of meters, and fully illustrates the injustice of selling water to consumers under the system of assessments made by estimating, or rather *guessing* what the quantity is that is being consumed.

A, B, C, etc., represents certain consumers in the city.

The second column shows the quantity of water that each one was found to be consuming by attaching meters to their service pipes.

The third column shows the amount each paid monthly previous to being metered.

The fourth column shows the rate per 1000 gallons that each one paid under the assessment plan.

CONSUMERS.	MONTHLY CONSUMPTION AS PER METER.	MONTHLY ASSESSMENT.	PAID FOR 1,000 GALLONS.
A.....	583,500 gals.	\$7 50	1½ cents.
B.....	132,000 "	2 00	1½ "
C.....	3,429,803 "	36 66	1 "
D.....	531,875 "	33 33	6¼ "
E.....	185,250 "	13 67	7½ "
F.....	2,697,831 "	119 16	4½ "
G.....	472,201 "	39 66	8½ "
H.....	259,312 "	17 50	6¼ "
I.....	138,850 "	28 33	20 "
K.....	727,125 "	50 00	6¾ "
L.....	2,127,050 "	53 33	2½ "
M.....	270,750 "	37 66	14 "
N.....	1,352,850 "	142 00	10¼ "
O.....	462,818 "	43 00	9¼ "

It will be seen by the above statement that but one of these consumers paid 20 cents per 1,000 gallons, which is the rate charged when the quantity is estimated, while one paid only *one* cent per 1,000 gallons, or one-twentieth of the amount charged the former.

It is a well known principle of good government that the most careful espionage should be maintained upon the weights and measures that are in use for the purpose of measuring the quantities of articles that are for sale; and yet, in every community where the assessment plan is in operation, the people collectively are selling water to themselves individually by means of a measure that is more like an elastic bag than anything else, that expands for some and shrinks for others.

FINANCIAL SAVING EFFECTED.

To properly estimate the *financial* saving effected by the restrictive measures adopted by the Board, it will be necessary to make an estimate of the quantity of water that would have been pumped each year had the circumstances remained the same. By an examination of the first table it will be seen that the average increase in the *pro rata* for each family during forty years has been $12\frac{5}{6}\%$ per cent. and that this per cent. for the past ten years has been $8\frac{1}{6}\%$.

Using this latter per cent. of increase we have the following table.

YEARS.	FAMILIES SUPPLIED.	WATER PUMPED—ESTIMATED.	
		TOTAL QUANTITY.	PER FAMILY.
1889	39,158	16,578,858,448	423,256
1890	41,467	19,042,973,344	459,323
1891	43,933	21,890,320,178	498,266
1892	46,400	25,084,675,200	540,618

The total quantity of water, according to this estimate, that would have been pumped during the four years, is 82,591,827,-179, and the quantity that was actually pumped was 49,330,152,-703, showing a saving of 33,261,674,467. By reference to the

second table it will be seen that the cost of pumping one million gallons of water, for five years previous to 1892 has been at the rate of \$4.45 per million. Multiplying the number of gallons of water saved by the cost of pumping, shows a saving of \$148,014.45 in the expense of pumping water alone.

The extension of the Works which seemed imperative upon the Board in the spring of 1889, and which your honorable body estimated would cost at least \$600,000, has been saved also, at least up to the present time. The interest upon this amount would have been \$24,000 per annum, and for four years \$96,000.

The meters including superintendency and every other expense incident to their introduction have cost the Board during the four years \$80,224.47.

The Superintendent of the meter department reports that the present valuation of these meters in service and in stock, including tools, etc., is \$71,618.37.

In conclusion then we have the following:

METERS.	DR.	CR.
To Expense.....	\$80,224.47	
By present values.....		\$ 71,618.37
By pumping expenses saved.....		148,014.45
By interest saved.		96,000.00
	<u>\$80,224.47</u>	<u>\$315,632.82</u>
Balance in favor of the meters.....		\$335,408.35

REDUCTION IN WATER RATES.

One year ago, in your report to the Common Council, these words were used, "*The cost of running the water department of any city, depends largely upon the quantity of water which the Works are called upon to supply. If the supply can be reduced so can the cost. If the cost can be reduced so can the rates for water; and that precisely is what your Commissioners are doing to-day.*"

I think I have already proved conclusively all except the last proposition, and now let us see about that

I am again obliged to have recourse to a tabular statement which shows first the years, second the total number of families supplied, third the total rates received, and fourth the *pro rata* amount for each family.

YEARS.	FAMILIES.	WATER RATES.	PER FAMILY.	
1876	20,102	\$205,624 74	\$10 22	
1877	20,345	210,288 12	10 33	
1878	20,603	208,198 95	10 10	
1879	21,341	218,110 13	10 22	
1880	22,465	227,452 78	10 12	
1881	23,749	241,884 32	10 18	
1882	25,442	261,725 79	10 28	
1883	27,415	280,049 06	10 21	
1884	29,422	300,467 24	10 21	
1885	30,583	313,205 10	10 25	
1886	31,946	314,952 31	9 85	WOULD HAVE RECEIVED AT AVERAGE \$10.21.
1887	34,486	332,834 59	9 36	\$326,168 06
1888	36,868	344,815 26	9 34	352,102 06
1889	39,158	367,925 27	9 39	376,871 23
1890	41,467	387,877 78	9 35	399,808 18
1891	43,933	389,079 97	8 85	423,878 07
1892	46,400	402,534 98	8 67	448,555 98
				473,744 00

There was a reduction in the rates in 1886. I have taken ten years previous to that, simply to establish this fact, that when the schedule of rates is unchanged, notwithstanding the fact that the rates received are from all purposes, business as well as families, the *pro rata* per family remains practically the same.

In 1876 the *pro rata* was \$10.22, and in 1885, ten years after, the *pro rata* was \$10.25. The average *pro rata* for these ten years was \$10.21, by which I can multiply the number of families supplied each year and ascertain almost the exact amount that would have been received, had the same rates been in force.

In the year 1886 the Board reduced the rate for household purposes for a family to \$5.00 per annum. This went into effect July 1, and affected the receipts of that year for six months only. In 1887, 1888, 1889 and 1890 the average *pro*

rata was reduced to \$9.36, which caused a reduction in our receipts of over \$30,000 per annum.

In 1891 the hose tax was abated, the reduction being about \$20,000 per annum, affecting the receipts of one-half of 1891, but all of 1892. At this time the meter rates were also reduced from ten cents per 1,000 gallons, first to six and two-third cents, then to five cents, and finally to three and one-third cents where it now stands.

The *pro rata* of 1891 was reduced to \$8.85 and that of 1892 to \$8.67, making the receipts of the latter year, affected by all these reductions, \$71,209.02 less than they would have been under the schedule of six years ago, and this reduction is due as follows:

To reduction in rates for family use.....	\$30,000 00
" " " hose tax.....	20,000 00
" " " meter rates.....	21,209 02

This amount, \$71,209.02, the Board are saving each year directly to the water rate payers, and are still enabled to meet all outstanding obligations, the expense of operating the Works and also of all construction and extension, which, on account of the rapid growth of our city and increased limits, has necessarily been very large.

METER RATES.

As shown by last year's report, there is no city in the world that supplies water as cheaply to the ordinary consumer as Detroit, *300 gallons of water for one cent!* Considerable has been said at various times as to whether the placing of meters did not discriminate against those who were thus supplied. Let us see. Last year we supplied to the entire consumption that was metered 1,589,885,250 gallons, for which we received \$61,585.62, or .038 cents for each 1,000 gallons.

During the same time we supplied all the consumption that was not metered 10,686,727,232 gallons, for which we received \$340,949.36, or for each 1,000 gallons, .034 cents.

It must be remembered, however, that the unmetered consumption includes all water for the Fire Department, and all

water for parks, fountains, etc. Could this amount be eliminated from the gross amount, I have no doubt but that the rate for 1,000 gallons under either manner of distribution would be the same, or nearly so.

OIL PLANT.

During the year 1891 the attention of the Board was attracted to the use of crude oil as a fuel, and information and results of experiences were sought for far and wide. The Board finally became perfectly satisfied that with proper combustion, 168 gallons of oil equaled in duty one ton of coal, and as oil could probably be contracted for at about one and one-half cents per gallon, and as coal had cost the Board in the coal houses on an average of \$4.25 per ton, it was safely estimated that there would be, under proper conditions, a saving of \$1.73 per ton of coal, or upon the basis of the consumption of 1890 (7616.50 tons), a saving annually of \$13,176.54.

On the 20th day of April, 1892, a contract was entered into with the National Supply Co., of Chicago, for an Oil Plant complete, including a pipe line of 10,000 feet to R. R. track in the sum of \$12,500.

The Plant consists of two tanks, each with a capacity of 1,873 barrels, inclosed in a brick house neat and tastefully constructed with corrugated iron roof, a suction pipe to boilers with two Snow Duplex Pumps in boiler house connected in batteries to be used alternately, and two oil burners under each of four boilers with the necessary steam and oil connections thereto.

The Pipe Line is of 3-inch wrought iron pipe and runs from Tank House through grounds to Jefferson avenue, west on Jefferson to Baldwin, north on Baldwin to Champlain, west on Champlain to Bellevue, thence north to Kercheval, and west again to Belt Line R. R. track. The line pump station house is built on the west side of this track and on a line with Kercheval street, is of brick and contains two Duplex Snow Pumps with 8-inch steam cylinder, 4-inch oil cylinder and 10-

inch stroke, and a 20-horse vertical boiler trimmed. The entire length of the pipe line is 12,412 feet.

The pumping station is 29 feet above the tank house and the number of gallons that can be discharged through the pipe by gravity alone is $33\frac{1}{2}$ gallons per minute.

The pipe line will hold 113 barrels of oil, but which can be pumped out by means of an extra suction pipe connected with the pumps in the boiler house.

The boilers at the Works are Marine boilers and the same that were placed there about 16 years ago, and though by no means the best adapted for the burning of oil, or coal for that matter, yet the results so far have been fully up to the expectation of the Board.

During the months of August, September and October, a portion, about two-fifths, of the fuel consumed was of coal, as the Board desired to relieve the pressure against the walls in the coal house, which gave evidence of giving way, and which it became necessary to repair immediately.

In November, oil was used exclusively and showed a saving of over \$1,000 as compared with the coal then in use.

In December the saving effected amounted to \$1,112. This saving is estimated on the old price of coal, \$4.25 in the coal house. If the present price of coal be taken into consideration, and I think it should as the price of oil undoubtedly is affected thereby, this saving is practically over \$600 more a month. The average monthly consumption of coal in 1890 was 634 tons, which at the present market price would have cost the Board at least \$5.25 per ton. Another saving by the use of oil is that of labor, which I have not spoken of before. Our force at the pumping works is reduced as follows:

One fireman, salary per month.....	\$55 00
Three coal passers, each \$45 00.....	135 00
Total saving each month.....	<u>\$190 00</u>
or \$2,280 each year.	

THE NEW ENGINE.

During the months of July and August there was such a prolonged season of heat and drought as to be almost, if not quite, an epidemic.

At certain times during the day, so great was the consumption of water at this time that all three of the engines were required to satisfy the demand, pumping some hours at the rate of three million gallons per hour. This was the first time in the history of the Works that it became necessary to run the three engines at the same time, which was not due in the least to the increased uses or increased consumption owing to the growth of the city, inasmuch as the total amount pumped during the year was much less than in 1887.

It was nothing more nor less than an epidemic, and an epidemic that was possible to occur again, and for that reason the Board of Water Commissioners deemed it its imperative duty to prepare for its recurrence.

It is an absolute necessity that there should be at all times one engine in reserve, as accidents and breakages are liable to occur, in fact are sure to occur, as our experience teaches us. Had the slightest occurred at the time above referred to, a great many consumers would have been deprived of water, especially in the northerly portions of the city.

For these reasons it was determined by the Board to purchase another engine, notwithstanding the fact that the annual consumption is steadily but surely decreasing. It was the strongly expressed wish of the Board, in referring this matter to Commissioner Kirby for investigation, to procure an engine of the very latest improved pattern, and one that would perform the work required at the very least expense.

Commissioner Kirby visited various cities and examined their pumping engines, and Chief Engineer Edwards and First Assistant Engineer Gould also visited Chicago and examined engines in operation there, and all were impressed with a preference for the Vertical Triple Expansion Engine manufactured by the Edward P. Allis Company. Proposals were solicited

from that company and also from Henry Worthington to furnish a Triple Expansion Engine, with foundation and boilers complete for operation. The Edward P. Allis Company's proposal was for a vertical engine for \$90,000, and that of Henry Worthington for a horizontal engine for \$87,000. The proposal of the former was considered the smallest of the two and was accepted by the Board.

The description of this engine is as follows:

It is guaranteed to deliver 24,000,000 gallons in 24 hours against a head of from 116 feet to 135 feet, and to develop a duty of 130,000,000 foot pounds for each 100 pounds of coal (best anthracite), in a 24-hours' test, and to develop a duty of 120,000,000 foot pounds for each 100 pounds of coal in a continuous test of 30 days, and to be supplied with steam at a pressure of 125 pounds per square inch. The steam cylinders will be 3 in number, one high pressure cylinder 28 inches in diameter, one intermediate cylinder 48 inches in diameter, and one low pressure cylinder 74 inches in diameter, all having a stroke of 60 inches.

There is to be 4 horizontal tubular boilers 62 inches in diameter by 20 feet long, each boiler to contain 49 4-inch tubes.

Contracts were also entered into for the extension of the engine house on the west end to correspond with the previous extension on the east end in the sum of \$22,000, which also includes the extension of the boiler house. This work has already commenced and is well under way. The entire cost of all construction, necessary to the operation of the engine, will be \$140,000.

DOCK.

It became a matter of necessity to do something in the way of repairing or rebuilding the dock, as it had reached such a dilapidated condition as to be not only an unsightly object but dangerous even to walk over. This dock forms the dividing wall between the canal and the settling basin and extends into the river about 800 feet beyond the south line of the basin, being in all 1,900 feet long.

It was determined by the Board to simply rebuild that portion extending out beyond the basin, and to leave the balance untouched until next season, when, unless some good reason should arise opposed to such action, to remove entirely that portion between the basin and canal, thus making the former larger to that extent.

Since the Board discontinued the purchase of coal as a fuel the canal and dock have ceased to be useful, and are certainly far from being ornamental, and it is the present opinion of the Board to do away with what will continue to be, as long as it exists, a source of endless expense.

INLET PIPES

The contract with Capt. Thos. Davis, of the season of 1891, to take up and relay what is known as inlet pipe No. 1, and to extend the same into the river 500 feet farther, was not completed until about August 1st, 1892.

The diver employed to inspect the condition of this pipe, as well as that of the other two inlet pipes, reported that in one instance he found an opening between the ends of the pipes large enough to admit the insertion of a hand, and that in a great many other instances the joints were by no means water tight, in fact that such a condition was almost an impossibility with the most careful attention unless packing was used. The Committee on Pumping Works were instructed by the Board to put these pipes in perfect condition, and the result was that under instructions from the committee, a contract was entered into in the sum of \$900 with H. F. Dwyer to caulk every joint thoroughly with packing in all the three inlet pipes.

This was accomplished thoroughly and to the satisfaction of the committee.

Inlet pipe No. 2, running alongside the dock and which is 500 feet shorter than the other two, was found in a bad condition. From near the shore to within about 100 feet from the end of the dock, the pipe has gradually worked upwards until about 200 feet of it is not more than two feet beneath the

water. This portion of the line, it was discovered, had been packed at the joints with cement, sewed up in bags, and which were placed in the bell end and hardened there. This cement had in the hardening process somewhat contracted, and at a number of places had broken and crumbled away. This inlet pipe from the strainer to about 100 feet north of outer end of dock was found in a good condition and was carefully packed by Mr. Dwyer.

It was, however, determined by the committee to do nothing further with this pipe, and to abandon the use thereof until some time in the future, when, if it was thought best, that portion nearest the shore could be taken up and relaid, and the whole be extended 500 feet farther into the river to correspond with the other two pipes.

FIRST PUMPING POWER.

Through the courtesy of Henry Plass and his sister, Mrs. Wm. H. Hopson, the Board are now in possession of the first pumping power used in the city of Detroit to supply its citizens with water.

In the year 1825 Bethuel Farrand, father of Jacob S. Farrand, and Rufus Wells, commenced the construction of Water Works under an act of the Common Council entitled "An act granting to Bethuel Farrand and his legal representatives the sole and exclusive right of watering the City of Detroit, and for other purposes."

Soon after Mr. Farrand transferred his interests to Mr. Wells, and in 1827 the Works were pronounced complete and the water introduced.

The pump house was erected at the foot of Randolph street. It was a frame building 20 feet square and had a cupola 40 feet high. The water was raised by two pumps of 5 inches bore, driven by *horse power* into a 40-gallon cask at the top of the cupola. From thence the water was led through tamarac logs of $4\frac{1}{2}$ inches interior diameter to the reservoir which was situated where the Water Office now is.

The reservoir was 16 feet square and 6 feet deep, and was

constructed of two-inch white oak planks caulked with oakum and placed on a timber frame 16 feet high and covered with a shingle roof. Water was distributed from this reservoir through a line of logs 3½ inches bore.

The *horse power* referred to is the one now in possession of the Board.

Mr. Henry Plass has furnished the Board with its history since its abandonment by the city in the year 1830. It was superseded by a 10-horse-power engine driving a rotary pump and forcing the water through a 3-inch iron pipe, a piece of which pipe is on exhibition at the Pumping Works today. The horse power was sold to Mr. Fairbanks who four years after sold it to Gabriel Chene by whom it was used in grinding apples. In 1858 the late Henry Plass purchased it of Mr. Chene and used it for some time in his cider mill located on At-water street. In 1866 he removed it to his farm in Grosse Pointe. It was here continued in its old service of grinding apples until 1878 when, in the words of Mr. Plass, "it stopped short never to go again."

This horse power has been removed to the Pumping Works and it is the intention of the Board to have it set up in some convenient place and preserved as an object of interest and curiosity.

CHIEF ENGINEER JOHN E. EDWARDS.

In the year 1860, thirty-two years ago, John E. Edwards was appointed Chief Engineer of the Works, and during all the intervening years has been a valuable and faithful official. The three large engines at the Pumping Works, which have been and still are objects of wonder and admiration, were designed by him, and, at the time of their construction, excelled in economical operation anything of their kind in the country, and even to-day, notwithstanding the progress made in this branch of engineering, are surpassed by few.

It had become apparent to the Board, however, during the year that is past, that Mr. Edwards, now in the 72nd year of his life, should be relieved from the active duties of his posi

tion, and in order that it might still retain the benefit of his knowledge and experience, appointed him Consulting Chief Engineer. A memorial prepared under the instructions of the Board and signed by the members thereof, was presented him which fitly expresses the prevailing sentiments of his employers, his associates and those who are acquainted with him.

PURITY OF THE WATER.

From time to time, there emanates from some source a doubt, and sometimes a direct denial, of the purity of the water supplied the city. We did not escape this the past year; in fact considerable agitation prevailed in the public mind, inasmuch as the origin of the assertion of its impurity was of such authority as to almost demand credibility.

It happened however very fortunately for the Works and the people that at this time Dr. J. E. Clark, a recognized authority in chemical analysis, was just completing a paper to be read before the Detroit Chemical Society, in which the purity of Detroit River water was treated exhaustively.

He closes his paper with these words: "*The result of my analysis demonstrates clearly that the water supply of our city is unexcelled, for purity, by that supplied to any other large city in the Union.*"

His paper together with an analysis made by the Health Officer, Dr. Samuel P. Duffield, will be found at the close of this volume.

I presume now that we can rest in peace, for a few years at least, as far as the unquestionable purity of the water is concerned.

COMPARATIVE STATEMENT.

The following table showing conditions of the past five years is very interesting. There is hardly a line that does not speak volumes to any one interested in the growth of our city and an economical administration of its affairs.

The most important fact however, as far as the Water

Works and its management is concerned, is forcibly illustrated in the two lines "Estimated population" and "Operating expenses."

From 1888 to 1892 the population has increased 46,000 with all its attendant factories and business interests and the expense for operating the Works instead of increasing in the same proportion has actually decreased \$2,251.00.

COMPARATIVE STATEMENT.

	1888.	1889.	1890.	1891.	1892.
Daily average consumption in gallons.....	38,397,716	35,274,898	38,208,067	38,033,592	33,634,554
Daily average consumption per capita.....	204	172	155	144	140
Total consumption in the year.....	14,330,166,670	12,875,384,453	12,120,914,582	12,057,261,236	12,276,612,482
Consumption through meters, gallons.....	91,750,000	189,090,000	628,944,765	1,194,842,400	1,599,885,250
Percentage of water metered.....	.00½	.01	.05½	.10	.13
Revenue from unmetered water.....	\$335,140.00	\$334,016.00	\$370,599.78	\$342,393.89	\$340,949.36
Revenue from metered water.....	\$9,175.00	\$13,909.00	\$37,278.00	\$46,684.08	\$61,585.62
Per one thousand gallons metered water...	.10	.10	.059	.038	.038
Per one thousand gallons unmetered water	.023	.027	.03	.031	.034
Number of families supplied.....	36,863	39,153	41,467	43,933	46,400
*Estimated population.....	192,730	203,992	214,122	228,254	238,683
Number of service connections.....	31,821	37,725	40,351	43,727	47,281
Miles of pipe.....	325	343	362	405	492
Number of meters.....	48	204	866	1,239	2,053
Expenditures for maintenance.....	\$101,019.00	\$102,587.00	\$102,391.00	\$95,591.54	\$99,561.52
Actual operating expense.....	\$98,783.50	\$93,931.00	\$93,746.85	\$88,036.62	\$91,534.82

* Obtained by multiplying number of families by 5.08, an average arrived at by dividing three U. S. Census by the number of families found the same years by the assessors.

FINANCIAL STATEMENT.

The following is a complete statement of the financial transactions of the Board for the past year.

RECEIPTS.

WATER RATES ACCOUNT:	
Rates paid.....	\$402,534 98
PERCENTAGE ACCOUNT:	
From delinquents.....	6,316 50
Penalties for shutting off	865 00
CITY OF DETROIT ACCOUNT:	
Tax levy.....	74,483 94
INTEREST ACCOUNT:	
Deposits, general fund.....	4,146 42
Deposits, sinking fund.....	1,763 17
REAL ESTATE ACCOUNT:	
Rents for office building	1,000 00
Rents for old pumping works	1,387 50
REPAIRING LEAKS ACCOUNT:	
Labor.....	176 62
SERVICE COCKS ACCOUNT:	
Stops, drilling and fines.....	8,026 70
IRON PIPE ACCOUNT:	
Bonus, laying extensions.....	3,825 38
Material and labor.....	4,371 49
PLUMBERS' LICENSE ACCOUNT:	
Paid for licenses	540 00
PUMPING WATER ACCOUNT:	
Sale of old material.....	30 00
Sale of ashes.....	15 00
METER ACCOUNT:	
Sale of old material.....	13 30
OIL PLANT ACCOUNT:	
Sale of lumber.....	75 58
PUMPING WORKS ACCOUNT:	
Rent of canal	350 00
Total receipts	\$509,360 58

The following are the expenditures of the Board classified under their different heads:

CONSTRUCTION.

IRON PIPE ACCOUNT:

Superintendent and clerks.....	\$5,980 18	
Labor.....	75,567 60	
Pipe.....	77,628 61	
Specials.....	5,543 66	
Hauling.....	1,596 14	
Lumber.....	843 36	
Coal.....	262 71	
Oil.....	31 12	
Packing.....	375 50	
Office materials.....	41 68	
Tools and repairing of.....	677 85	
Lead.....	13,162 96	
Plugs.....	192 39	
Repairs and materials for.....	83 67	
Repaing.....	1,188 67	
Street car and toll tickets.....	58 15	
Livery.....	85 75	
Damages.....	60 68	
Wagon and harness supplies.....	200 21	
Feed.....	402 99	
Farrier.....	135 75	
Lead pipe, solder, nails, etc.....	128 82	
Horses.....	405 00	
Repairing culvert.....	15 95	
Phaeton.....	100 00	
Bonus repaid.....	32 50	
		<hr/> \$124,801 83

STOP COCK ACCOUNT:

Labor.....	\$430 35	
Valves.....	6,110 37	
Boxes and covers.....	2,302 39	
Repairs and materials for.....	56 07	
		<hr/> \$4,899 18

METER ACCOUNT:

Superintendent and labor.....	\$8,269 17	
Meters.....	12,371 82	
Freight and express.....	63 75	
Tools and repairing of.....	158 13	
Lumber, lead, etc.....	884 31	
Cartage and street car tickets.....	180 33	
Specials and fittings.....	1,090 49	
Horse, wagon, feed, etc.....	547 24	
		<hr/> \$23,565 24

PUMPING WORKS ACCOUNT:

Architect.....	\$675 00	
Relaying inlet pipe contract.....	5,225 00	
Labor.....	541 28	
Tools and repairing of.....	4 14	
Materials for repairs.....	251 85	
Rebuilding dock.....	5,900 00	
Repairing Hydrants.....	12 00	
Diving.....	74 00	
Picking inlet pipes.....	1,056 50	
Boat.....	30 00	
Removing piles.....	356 47	
Damages.....	150 00	
Engineer's expenses to Chicago.....	41 25	
Enlarging engine house contract.....	2,000 00	
		\$16,317 49

REAL ESTATE ACCOUNT:

Insurance.....	\$398 09	
Changes and repairs of buildings.....	1,725 12	
Reservoir fence, materials and labor.....	345 01	
		\$2,468 22

THE PLANT ACCOUNT:

Original contract.....	\$12,500 00	
Extra from contractor.....	1,278 66	
Lumber, lead pipe, etc.....	710 59	
Repaving.....	10 00	
Coal shed.....	21 59	
Boiler cover, stop and express.....	42 85	
Meter.....	45 13	
Extra burners.....	40 47	
		\$14,649 29

Total construction expenses.....**\$270,596 25**

OPERATING EXPENSES**PUMPING WATER ACCOUNT:**

Engineers and firemen.....	\$18 400 42	
Coal.....	25 61	
Natural gas.....	20 936 86	
Fuel oil.....	7,306 75	
Potash.....	25 75	
Repairs and materials for.....	3,268 98	
Lubricators.....	278 61	
Supplies—rags, waste, etc.....	123 70	
Supplies—tools, etc.....	118 84	
Express.....	25	
Car tickets.....	5 00	
Stationery and postage.....	6 80	
		\$30 497 60

REPAIRING LEAKS ACCOUNT:

Labor	\$6,835 72	
Tools and repairing of	186 32	
Car tickets	190 00	
Wagon and harness supplies and repairs	47 80	
Feed	148 12	
Leather coats	18 00	
Farrier	53 50	
		\$6,979 46

TELEPHONE:

Rent	\$419 40
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PERCENTAGE ACCOUNT:

Labor	\$1,725 00	
Feed	24 48	
		\$1,749 48

SERVICE COCKS ACCOUNT:

Clerk and labor	\$7,368 76	
Materials, tools and repairs of	144 82	
Valves, branches and cocks	1,920 71	
Tapping machine	1,850 00	
Repairing pavements	53 37	
Wagon and harness supplies and repairs	268 40	
Horses	375 00	
Feed	104 30	
Tickets	10 00	
Farrier	56 75	
		\$11,652 11

OFFICE ACCOUNT:

Secretary, assessors and clerks	\$19,325 00
Printing and binding	1,331 23
Advertisements and subscriptions	166 14
Watchmen and janitor	1,071 00
Supplies—soap, matches, etc.	223 89
Supplies—stationery	322 74
Water Works association dues	3 00
Furniture, fixtures and repairs of	362 72
Extra services	602 45
Fuel	474 93
Light	241 05
Postage	51 00
Attorney	600 00
Expert examiners	40 00
Germicide	33 00
Sprinkling	85 32
Ice	23 10
Street car tickets	24 00
Counterfeit money	13 25

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Lost money	\$5 00
Horseshoeing, etc.	161 00
Feed	52 79
Carriage harness and repairs	178 21
	<hr/> \$25,390 82

INSPECTION ACCOUNT:

Labor	\$2,872 65
Total operating expenses	<hr/> \$99,561 52

HURLBUT FUND.

Superintendent and labor.	\$2 842 35
Materials, lumber, etc.	36 38
Green house expenses	190 72
Tools and repairs	60 00
Hitching posts	18 00
Seeds, plants and pots	79 26
Gravel	595 43
Settees	192 00
Sprinkling cart	42 00
Wagon and harness repairs	25 00
	<hr/> \$4,081 14

INTEREST ACCOUNT.

Interest on bonds	\$76,905 00
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RECAPITULATION.

Construction	\$250,596 25
Operation expense	99,561 52
Hurlbut fund	4 081 14
Interest	76,143 91
	<hr/>
Aggregate expenditures for 1892	\$431,143 91

ACTUAL COST OF OPERATION.

To obtain this there should be deducted from the total expense for maintenance the sum of \$8,026.70, which was received from plumbers for material and labor, in furnishing service cocks, valves, sleeves, etc., for service connections, the cost of which is charged to this account. This would leave, as the actual cost of operation, \$91,534.82.

STATEMENT.

Cash on hand January 1, 1892.....	\$94,035 35	
Receipts for the year.....	509,360 58	
		<u>\$603,395 93</u>
Expended in 1892.....	\$431,143 91	
Cash on hand January 1, 1893.....	172,252 02	
		<u>\$603,395 93</u>

To the Honorable Board of Water Commissioners of the City of Detroit:

GENTLEMEN:—Under instructions from the Committee on Ways and Means, we have carefully examined the books and vouchers of the Water Works from January 1st to December 31st, 1892, and find them correct.

Cash on hand in office.....	\$4,106 63
Commercial National Bank, general fund.....	119,249 24
Commercial National Bank, sinking fund.....	48 896 15
	<u>\$172,252 02</u>

Respectfully submitted,

(Signed)

DANIEL R. PIERCE,
JOHN HOSMER.

COLLECTIONS IN DISTRICTS UNDER OLD ARRANGEMENTS.

YEAR.	1st DISTRICT. WARDS 7 AND 9.	2d DISTRICT. WARDS 3 AND 5.	3d DISTRICT. WARDS 1 AND 2.	4th DISTRICT. WARDS 4 AND 6.	5th DISTRICT. WARDS 8 AND 10.	6th DISTRICT. WARDS 12, 14 AND 16.	7th DISTRICT. WARDS 11, 13 AND 15.	METERS.	AGGREGATE.
1896-7	.....	.....	.....	.....	\$11 25	.....	.....	.....	\$11 25
1897-8	.....	.....	.....	.....	24 25	.....	.....	.....	24 25
1898-9	.....	\$2 50	\$2 00	\$5 00	14 00	.....	.....	.....	28 50
1899-90	\$7 00	7 50	12 50	9 75	17 75	.....	.....	.....	54 50
1890-1	10 00	31 00	33 00	38 50	42 00	\$25 50	\$10 75	.....	190 75
1891-2	21,665 69	21,571 53	29,228 87	26,969 39	23,016 11	30,277 49	21,866 08	\$26,752 12	191,347 23
Total	\$21,682 69	\$21,612 53	\$29,276 87	\$27,022 64	\$23,125 36	\$20,302 99	\$21,876 75	\$26,752 12	\$191,651 48

COLLECTIONS IN DISTRICTS AS RE-ARRANGED JULY 1st, 1892.

YEAR.	1st DISTRICT. WARDS 9 AND 15.	2d DISTRICT. WARDS 11 AND 13.	3d DISTRICT. WARDS 1 AND 7.	4th DISTRICT. WARDS 3 AND 5.	5th DISTRICT. WARDS 2 AND 6.	6th DISTRICT. WARDS 10 AND 14.	7th DISTRICT. WARDS 4 AND 12.	8th DISTRICT. WARDS 8 AND 16.	METERS.	AGGREGATE.
1892-3	\$22,024 45	\$16,760 69	\$20,280 29	\$22,622 62	\$23,636 09	\$19,140 54	\$28,494 07	\$17,141 01	\$34,838 50	\$210,888 50
									\$401,585 62	\$402,584 96

WATER WORKS BONDS.

The following table shows the whole history of the bonded indebtedness of the Board, in which will be seen that the total amount of bonds issued is \$1,850,000, of which \$621,000 have already been redeemed, leaving outstanding \$1,229,000, upon which there is an annual interest of \$76,540.

One hundred and forty-six thousand dollars of these bonds fall due the first of next August, which will be redeemed by the Board without new issuance. This will leave \$1,083,000, at an annual interest of \$66,320.

NO. OF ISSUE.	ACT OF	ISSUED.	PAYABLE.	AMOUNT.	RATE OF IN- TEREST.	REDEEMED.	OUT- STANDING.
1st	1873	Aug. 1, 1853	Aug. 1, 1893	\$100,000	7cts.	\$100,000	.....
"	"	" "	Aug. 1, 1873	100,000	7 "	100,000	.....
"	"	" "	Aug. 1, 1873	50,000	7 "	50,000	.....
2nd	1855	Aug. 1, 1855	Aug. 1, 1890	100,000	7 "	100,000	.....
"	"	June 12, 1855	Aug. 1, 1885	100,000	7 "	100,000	.....
"	"	" "	Aug. 1, 1880	50,000	7 "	50,000	.....
3rd	1857	Aug. 1, 1858	Aug. 1, 1893	150,000	7 "	4,000	\$146,000
"	"	Aug. 1, 1847	Aug. 1, 1887	100,000	7 "	100,000	.....
4th	1860	Feb. 1, 1870	Feb. 1, 1900	100,000	7 "	.....	100,000
5th	"	Aug. 1, 1872	Aug. 1, 1902	50,000	7 "	.....	50,000
6th	"	Aug. 1, 1873	Aug. 1, 1903	50,000	7 "	.....	50,000
"	1873	Feb. 1, 1874	Feb. 1, 1904	50,000	7 "	9,000	41,000
7th	1869	Aug. 1, 1874	Aug. 1, 1904	50,000	7 "	6,000	44,000
"	1873	" "	" "	200,000	7 "	.....	200,000
"	"	June 1, 1875	June 1, 1905	150,000	7 "	1,000	149,000
"	"	June 1, 1876	June 1, 1906	200,000	6 "	1,000	199,000
"	"	Sept. 1, 1880	Sept. 1, 1890	100,000	4 "	.....	100,000
"	"	April 1, 1881	April 1, 1897	100,000	4 "	.....	100,000
"	"	Dec. 1, 1881	Dec. 1, 1896	50,000	4 "	.....	50,000
				\$1,850,000		\$621,000	\$1,229,000

ASSESSMENT REPORT.

The following table is a statement of the assessment made in May and June and going into effect July 1, 1892. The whole number of families in the city at that time was 46,985.

The assessments amount to \$335,694, and, as the report shows that there were taken from the assessment rolls for the purpose of metering, places aggregating on former rolls \$12,364, this sum should be added to the "gain" as shown in table, \$4,985, to show the real gain, which is \$17,349.

There have been taken from the assessment rolls for the purpose of metering during the last four years, places whose aggregate assessments amounted to \$62,240. In addition to this there have been metered all places of business and factories that have been established in the meantime.

The aggregate upon the assessment rolls of '92-3 is still a little over \$3,000 more than that of 1888.

WATER RATES.

ASSESSMENT FOR THE YEAR 1892-1893.

WARDS.	FAMILIES.			Family Tenements found Vacant.	Increase Assessed.	ASSESSMENT.		
	Assessed.	Not Assessed.	Whole Number.			1892-93.	Increase or Decrease	\$ reduced by use of meter.
1st DIST.—								
Ninth.....	4,583	34	4,617	71	175	\$27,140	+ \$1,332	62
Fifteenth.....	1,915	76	1,991	40	464	12,499	+ 2,570	214
Total.....	6,498	110	6,608	111	639	39,639	+ 3,902	276
2d DIST.—								
Eleventh.....	3,167	10	3,177	68	133	19,616	+ 716	295
Thirteenth.....	2,112	29	2,141	58	157	13,028	+ 850	146
Total.....	5,279	39	5,318	126	290	32,644	+ 1,566	441
3d DIST.—								
First.....	2,441	18	2,459	104	98	29,728	- 2,585	3,081
Seventh.....	3,040	26	3,066	67	140	19,929	+ 1,215	139
Total.....	5,481	44	5,525	171	238	49,657	- 1,370	3,820
4th DIST.—								
Third.....	3,143	25	3,170	85	59	21,079	- 699	861
Fifth.....	3,568	14	3,582	65	72	22,063	+ 217	206
Total.....	6,713	39	6,752	150	131	43,142	- 482	1,367
5th DIST.—								
Second.....	2,014	3	2,017	106	15	28,814	- 4,884	4,575
Sixth.....	3,355	2	3,357	167	106	25,480	+ 1,259	182
Total.....	5,369	5	5,374	273	91	54,294	- 3,625	4,757
6th DIST.—								
Tenth.....	3,883	4	3,887	67	157	24,428	+ 548	433
Fourteenth.....	2,012	63	2,075	35	109	12,222	+ 1,104	75
Total.....	5,895	67	5,962	105	326	36,650	+ 1,652	508
7th DIST.—								
Fourth.....	2,912	6	2,918	98	50	27,332	+ 124	787
Twelfth.....	2,956	12	2,968	80	157	17,820	- 159	181
Total.....	5,868	18	5,886	178	207	45,152	- 35	968
8th DIST.—								
Eighth.....	3,134	9	3,143	84	131	21,607	+ 1,250	185
Sixteenth.....	2,190	254	2,884	35	406	12,431	+ 2,039	40
Springwells.....	33	.....	33	.....	8	478	+ 88	.....
Total.....	5,357	263	5,560	119	545	34,516	+ 3,377	225
Aggregate.....	46,400	585	46,985	1,218	2,467	\$135,694	+ \$4,985	12,364

The amount expended for the new Works to January 1st, 1893, is as follows:

ITEMS	EXPENDED PREVIOUSLY.	1892.	TOTAL.
Land.....	\$35,000 00	.....	\$35,000 00
Force Mains.....	609,414 77	.....	609,414 77
Inlet Pipes.....	84 271 34	\$6,855 50	90,626 84
Dock Basin and Canal.....	129 409 12	5,900 00	135,309 12
Conduits and Conduit Wells.....	73,710 52	.....	73,710 52
Engine-Boiler and Coal Houses.....	161,164 04	2,968 10	164,132 14
Stand Pipe and Tower.....	30,420 72	.....	30,420 72
Pump Wells.....	54 221 56	.....	54 221 56
Engines.....	265,642 24	.....	265,642 24
Boilers.....	44 248 40	.....	44,248 40
Engineer's House.....	7,773 14	.....	7,773 14
Sewer.....	3,066 25	.....	3,066 25
Grounds.....	50,551 18	4,081 14	54 632 32
Inspection.....	2,977 86	.....	2,977 86
Miscellaneous.....	8,756 83	1,093 89	9,850 72
Total.....	\$1 561,227 97	\$20,398 63	\$1,581,626 60

VALUATION OF THE WORKS.

The following is an inventory of the properties of the Board as invoiced by the several heads of departments.

RECAPITULATION.

Office building and lot.....	\$60,000 00
Three lots Orleans street.....	41,250 00
Reservoir grounds and improvements thereon.....	47,200 00
Oil pumping station.....	14,649 29
Grounds at new pumping works.....	250,000 00
Buildings, docks, basin conduits, etc.....	752,877 60
Water pipe laid and in use.....	2,994,850 37
Meters placed and in use.....	68,733 99
	<u>\$4,229,561 35</u>

TOOLS AND MATERIAL ON HAND.

In office building.....	\$9,073 68
In repair department.....	2,107 45
In meter department.....	2,894 88
At reservoir grounds, horses, trucks, etc.....	4,438 97
At reservoir grounds, pipes specials, etc.....	26,755 54
At Inspector's department.....	682 00
At new pumping works.....	23,232 74
	<u>\$69,099 71</u>
Aggregate.....	<u>\$4,298,660 98</u>

INVENTORY OF THE WORKS.

OFFICE.

Office building and lot.....	\$60,000 00	
Counter in office.....	1,041 00	
Furniture in Board room	588 18	
Fourteen office tables.....	215 00	
Six bookcases.....	660 00	
Three wardrobes.....	335 00	
Six desks.....	178 00	
Thirty-six office chairs.....	91 50	
Twelve office stools.....	45 00	
Eight city maps.....	20 00	
One marble office clock.....	100 00	
Three atlas maps.....	50 00	
Partitions in office.....	800 00	
Railing in office.....	50 00	
Heating apparatus.....	1,400 00	
Electric light fixtures.....	55 00	
Miscellaneous properties.....	100 00	
Horse, harness, buggy and appurtenances.....	335 00	
Upstairs—		
One cabinet desk.....	30 00	
One small desk.....	10 00	
One upright desk	10 00	
Three bookcases.....	80 00	
One table.....	10 00	
One cabinet drawing table.....	50 00	
Two drawing tables.....	35 00	
Drawing tools.....	70 00	
Maps and drawings.....	2,500 00	
Chairs.....	10 00	
Safe	200 00	
One clock.....	15 00	
		\$69,073 63

PUMPING WORKS.

Three lots corner Atwater and Orleans street.	\$41,250 00
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REPAIR DEPARTMENT.

Tools and materials.....	\$2,107 45
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OIL PUMPING STATION.

Cost of plant erected in 1892.....	\$14,649 29
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METER DEPARTMENT.

Valuation of meters in use.....	\$68,733 99	
Valuation of meters in stock.....	1,975 65	
Valuation of tools.....	309 72	
Valuation of material in stock.....	175 01	
Horse, wagon and harness.....	424 00	
		\$71,618 37

RESERVOIR.

Grounds including houses.....	\$47,200 00
Railroad siding.....	637 97
Seven horses.....	1,050 00
Five repair wagons.....	200 00
One mud wagon.....	50 00
Two sleighs.....	120 00
One large truck.....	200 00
Two light trucks.....	800 00
Storage platform.....	400 00
Seven pipe derricks.....	700 00
Harness, covers and blankets.....	250 00
Tools and material.....	516 00

\$51,623 97

STOCK AT RESERVOIR.

Iron pipe.....	\$13,493 75
Specials.....	4,178 64
Gates and valves.....	1,036 00
Gate boxes.....	48 00
Lead.....	6,213 10
Packing.....	86 67
Oil.....	2 60
Coal.....	16 69
Scrap iron.....	1,680 00

\$26,755 54

INSPECTION.

Six carts.....	\$500 00
Six set of harness.....	90 00
Six horse covers, rubber.....	9 00
Six horse blankets.....	18 00
Two pair runners.....	15 00

\$632 00

NEW PUMPING WORKS.

Grounds.....	\$250,000 00
Water pipe.....	86,020 47
Tank and basin.....	69,825 72
Engine boiler and coal houses.....	127,391 23
Steel pipe and tower.....	29,804 25
Engines.....	255,000 00
Flashes.....	31 500 00
Engineer's house and barn.....	6,000 00
Conduits and wells.....	72,187 06
Drain wells.....	53,648 58
Drawbridge and foundation.....	5 000 00
Erecting fountain.....	175 00
Underground improvements.....	16,325 20

\$1,002,877 60

TOOLS AND MATERIALS.

Tools.....	\$1,068 35
Material (rope, waste, etc.).....	829 96
Material (gauges, valves, etc.).....	754 34
Material (iron, lead, etc.).....	1,016 78
Furniture.....	372 45
Wood and coal.....	14,056 93
Horses and vehicles.....	126 00
Hoisting engine, gas and electric light plant and supplies.....	3,450 51
Tools and implements (Hurlbut fund).....	647 42
	<hr/> \$23,222 74

IRON PIPE IN GROUND.

103 feet 45 inch pipe.....	\$1,699 50
44,909 feet 43 inch pipe.....	612,177 14
715 feet 36 inch pipe.....	6,587 35
49,337 feet 30 inch pipe.....	322,404 86
73,174 feet 24 inch pipe.....	358,157 93
461 feet 20 inch pipe.....	1,751 80
87 feet 18 inch pipe.....	278 40
32,319 feet 16 inch pipe.....	89,855 08
6,598 feet 12 inch pipe.....	12,227 38
104,259 feet 10 inch pipe.....	155,437 47
218,095 feet 8 inch pipe.....	286,941 22
805,571 feet 6 inch pipe.....	630,387 49
832,406 feet 4 inch pipe.....	527,704 27
78,363 feet 3 inch pipe.....	38,489 39
2,820 feet 2 inch pipe.....	752 10
	<hr/> \$2,994,850 37
2,251,219 feet	
Aggregate.....	<hr/> \$4,298,660 96

Respectfully submitted,

L. N. CASE,
Secretary.

REPORT OF SUPERINTENDENT OF METERS AND INSPECTION.

DETROIT, January 2, 1893.

To the Board of Water Commissioners:

GENTLEMEN—In compliance with the rules of your honorable body, I herewith report the work done in the meter and inspection departments during the year 1892.

The following tables show the number of meters placed, the number removed, and the total number in service on the 31st day of December, 1892:

Placed.

	SIZES.							Total
	$\frac{1}{2}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{2}$ in.	2 in.	3 in.	4 in.	
Total number of meters placed during the year 1892.....	510	245	135	15	24	14	6	949

Removed.

	SIZES.							Total
	$\frac{1}{2}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{2}$ in.	2 in.	3 in.	4 in.	
Premises vacant.....	31	7	6	2	5	2	2	45
For repairs.....	14	2	16	3	5	2	2	44
Too small for required supply.....	9	5	4	3	6			27
Too large for required supply.....		1	7		1			9
Total number removed.....	44	15	33	8	17	4	4	125

Meters in Service.

	SIZES.								Total
	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{4}$ in.	2 in.	3 in.	4 in.	6 in.	
Meters in service Jan. 1, 1892.	457	175	364	69	95	47	20	2	1,229
Meters placed during the year, and in service Jan. 1, 1893.	466	230	102	7	7	10	2	.....	824
Total number of meters in service Jan. 1, 1893.	923	405	466	76	102	57	22	2	2,053

The following tables show the kind and sizes of meters placed during the year, also those removed:

Placed.

KIND.	SIZES.								Total
	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{4}$ in.	2 in.	3 in.	4 in.	6 in.	
Thomson	502	244	129	14	18	12	4	.....	923
Crown	3	1	3	1	2	1	.....	.....	11
Hersey .....	.....	.....	3	.....	.....	1	2	.....	6
Worthington	4	.....	.....	.....	4	.....	.....	.....	8
Union Rotary	1	.....	.....	.....	.....	.....	.....	.....	1
Total placed	510	245	135	15	24	14	6	.....	949

Removed.

KIND.	SIZES.								Total
	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{4}$ in.	2 in.	3 in.	4 in.	6 in.	
Thomson	27	12	8	5	6	1	1	.....	60
Crown	9	2	6	2	2	.....	.....	.....	21
Hersey	1	1	11	1	1	2	3	.....	20
Worthington	5	.....	4	.....	8	.....	.....	.....	17
Union Rotary	2	.....	4	.....	.....	1	.....	.....	7
Total removed	44	15	33	8	17	4	4	.....	125

The following table shows the total number of meters in service and the different kinds and sizes, also indicators attached to hydraulic elevators:

KIND	SIZES.									Total
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{2}$ in.	2 in.	3 in.	4 in.	6 in.	Indi- cators	
Thomson	858	383	330	57	63	37	7	2		1,737
Crown	89	16	48	11	13	8	4			139
Jersey	3	4	44	2	12	1	7			73
Worthington	14	2	18	4	12	10	3			63
Union Rotary	9		2	2	2	1	1			17
Chapin			2							2
Squitable			1							1
Ball & Pitts			1							1
Indicators									8	8
Total No. in service Jan. 1, 1893	923	405	466	76	102	57	22	2	8	2,061

Meters in Stock.

KIND.	SIZES.								Total
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{2}$ in.	2 in.	3 in.	4 in.		
Thompson (New).....	34	12	3	8	4	.....	1	62
Crown.....	13	2	5	1	.....	1	.....	22
Jersey.....	1	1	8	1	1	1	1	14	
Worthington.....	3	2	4	.....	.....	.....	.....	9
Union Rotary.....	3	.....	3	.....	.....	.....	.....	6
Total number in stock.....	54	17	23	10	5	2	2	113	

Valuation of meters in stock, January 1, 1893	\$1,975 65
Valuation of material in stock, January 1, 1893	175 01
Valuation of tools January 1, 1893	309 73
Valuation of horse wagon, etc., January 1, 1893	424 00

Total, \$2,884 39

Valuation of meters in service, January 1, 1892	\$50,187 49
Deduct 10 per cent. for depreciation in value	5,018 74

Present valuation of meters in service January 1, 1892	45,168 75
Add amount expended during the year for meters placed	23,565 24

Total valuation of meters in service, January 1, 1893, \$68,733 99

Cost of material used in repairing meters in 1892	\$5 28
Cost of labor in repairing meters in 1892	234 00

Total, \$239 28

Summary of total amount expended in the meter department for the years 1889, 1890, 1891 and 1892:

	1889	1890	1891	1892	Aggregate
Meters	\$11,175 00	\$18,700 00	\$ 6,501 55	\$12,871 82	\$ 48,748 37
Supt. and labor.....	1,734 10	8,510 57	4,841 40	8,269 17	23,355 24
Material, tools, etc.....	637 26	2,982 14	872 99	2,132 98	6,625 37
Freight, hauling, etc.....	98 06	408 97	197 11	244 08	948 22
Horse, wagon, etc.....				547 24	547 24
Total	\$13,644 41	\$30,601 68	\$12,413 14	\$23,565 24	\$ 80,224 47

During the last year we have placed 824 meters, and adding them to the number in service on the first day of January, 1892, makes a total of 2,053 meters in service on January 1st, 1893.

Each year brings additional proof of the necessity and justice of the meter system. Nothing can be more evident than that the measurement of water to each consumer is the only true way to arrive at the proper amount each should pay. So long as there is to be a price for water there is no other way to make a just charge other than for the amount consumed. It is simply impossible to estimate waste correctly, and there is where a large proportion of the water goes to, as the quantity pumped is about 140 gallons per head per day, while in cities that are metered the quantity is about 45 gallons, and that is a large average, for some cities are much lower, especially that of the City of Liverpool, England, where it is only 13 gallons.

Some claim that they should not be restricted in the use of water by placing a meter on their premises, but we tell them it does not restrict its use. If they find it necessary to use twice as much as their neighbor there does not seem to be any good reason why they should not pay twice as much for it. If it is not just for everybody to pay for the amount consumed then the only way left would be to have each consumer pay the same amount and use much or little as the case might be without regard to cost of furnishing it. Where it might cost only a dollar to furnish a certain quantity to one person his neighbor might use what would cost ten or a hundred dollars to furnish,

and yet if they are not to pay according to the quantity consumed the latter should have his for one dollar the same as the former. Of course the hundred dollar fellow would not object, but the one who only used one dollar's worth would, for he ought not to help pay for the one who used the larger amount, and that is just what he would have to do and is what the water takers have been doing and will continue to do under the old system of estimating the quantity used. As I said before it is simply impossible to estimate the waste and in many cases very difficult indeed to estimate the legitimate uses.

With good plumbing and proper attention nobody need fear the meter. It is harmless in itself, but they must not expect it to remain quiet when the water is going to waste. It is placed there principally for the purpose of preventing the same and it is a very faithful servant, remaining on duty night and day for three hundred and sixty-five days in the year and is seldom caught napping, as quite a number of consumers can testify.

I have a few cases that are quite interesting showing the value of the meter. One firm of manufacturers who had been using from 20,000 to 25,000 cubic feet per month jumped to 225,000 cubic feet one month, and it was a mystery to know where so much water could have gone, as they had been running just the same as usual. Of course the first thing to do was to condemn the meter, as it is always looked upon as the guilty one, until proven to the contrary, but as is generally the case—as in this—the meter was not at fault. The firm had employed a new engineer and said engineer had been with them nearly a month before discovering that there was a meter on the premises. They had a 2-inch service pipe leading to a tank from which they took their supply, said tank—not having an automatic shut off—when full overflowed into the sewer, and the engineer having turned on the water, thought it necessary in order to keep the tank full to leave it turned on all the time with the foregoing result, that is, consuming 225,000 cubic feet instead of 25,000 cubic feet, or eight times more than was necessary, and in all probability they would have continued to use it in the same

way had it not been for the meter. A few days ago I had a telephone from a person "to send a man to his store immediately and stop the meter." I asked him if *it* was going away, he said no, but he had the water all shut off from every portion of his building and the meter kept going along just the same and he wanted it stopped. On sending to examine it he found it an easy matter to stop it and did so by turning the water off in a closet in a portion of the building occupied by a tenant which he had overlooked.

It is quite a common occurrence to have the consumption reduced from 35,000 cubic feet per month to two or three hundred cubic feet in same length of time, after the first meter bill has been presented. In metering places where the rates have been paid in advance, the occupant has a month or two after placing the meter to see how much water he is using, and usually makes a wonderful reduction in the amount before he commences to pay by meter measurement.

On one assessment of \$64 per year including a block of offices and one family and a smaller building containing family and office, the larger building assessed at \$52 and the smaller one at \$12. The first two months showed a consumption of 9,800 cubic feet on the larger building, and 44,800 on the smaller one, or nearly five times more water on an assessment of \$12 than on an assessment of \$52. Of course in the smaller building it was very nearly all waste, the legitimate uses being only two or three hundred feet while the waste was from seven to thirty-five thousand feet per month caused by what we call a rod closet which does not shut off automatically and when turned on usually remains so, unless it affects the supply in other portions of the building.

Two years ago your honorable body adopted a rule prohibiting any more of said closets being put in, and I think it would be a move in the right direction to order all now in use changed to self-acting ones of some kind; either that or place a meter on them.

There are quite a number of places we would like to meter were it not for the expense. In former years the number of

connections for each building was not limited, so that in case the owner wanted water in some portion of his premises where he could make connection with the main pipe at a less cost than he could make the extension from the one already in, he was allowed to do so; and now when we want to meter the premises we find as many as three connections requiring three meters, where the whole amount of water used could easily be supplied through one $\frac{3}{4}$ -inch connection. I should think it advisable in such cases to compel the owner to connect his pipes in such a manner as to take his whole supply through one pipe where it is practical to do so, or else make a minimum charge for each meter, which would—in many cases—produce the same results, but as it is at present, with a minimum price for total amount consumed, regardless of the number of meters, permits the consumer to ask for a meter on each connection, without any extra charge.

During the last year we have metered all new connections to be used for manufacturing and other business purposes together with stores and business places where the assessment was \$9 per year or upwards. Nine dollars being the present minimum price per year for each premise metered we have not placed them on premises where the assessment has been less than that amount in order not to increase the assessment unless the consumption warranted it. But our examiners find a large waste in many places where the assessment is only five or six dollars per year, and I think it would be wise to make a smaller minimum rate so that all such places could be metered.

INSPECTION.

In this department, we still continue the house to house inspection, but with only four examiners instead of five, as last year. About one-third of their time is occupied in reading meters and delivering bills each month. As the work in the meter department increased, one of the examiners was transferred permanently to said department, thinking the four remaining would be able to give all the time necessary for the examination

of leaks, but so much of their time has been taken up in the reading of meters and delivering bills that they have not been able to get over the city twice as in former years, which, I think, accounts for the increased percentage of leaks reported.

They have made 50,288 examinations, reported 3,335 leaks, of which 3,053 were repaired and 282 ordered shut off for failing to comply with notice. The percentage of leaks reported to number of examinations made in 1891 was 4.77 per cent., and in 1892 it was 6.63 per cent., showing that it will be necessary, in order to keep the waste from increasing on unmetered premises, to make at least two examinations throughout the city each year.

The same course has been followed as last year. The occupant has been given a stated time to repair the leak, and at the expiration of said time, if the repairs are not made, the water is ordered shut off, unless it was in two or three cases where the owners were in destitute circumstances and not able to make the repairs, and to have shut the water off would have been cruel. In those cases we made the repairs ourselves with the men employed in the leak department, and at times when they were not busy with other work.

The change made early in the year in regard to plumbers' license—that is, giving all plumbers a first-class license and then holding them to a rigid compliance with our rules and regulations governing plumbers and plumbing—has given good satisfaction to the plumbers and caused everything to move without friction in this department. I think there is better plumbing being done throughout the city than ever before—that is, so far as our inspection extends. As we have nothing to do with the sanitary part of it, we have paid very little attention to that portion of the plumbing, but, from what we have seen, think there is a great field for the proper authorities to labor in. The owners, in most cases, appreciate our efforts to have that portion of the plumbing over which we have control done to our satisfaction, but occasionally we find a person who insists on having his plumbing done to suit himself, regardless of our rules—such as using any kind of lead or iron pipe, putting in

connections for each building was not limited, so that in case the owner wanted water in some portion of his premises where he could make connection with the main pipe at a less cost than he could make the extension from the one already in, he was allowed to do so; and now when we want to meter the premises we find as many as three connections requiring three meters, where the whole amount of water used could easily be supplied through one $\frac{3}{4}$ -inch connection. I should think it advisable in such cases to compel the owner to connect his pipes in such a manner as to take his whole supply through one pipe where it is practical to do so, or else make a minimum charge for each meter, which would—in many cases—produce the same results, but as it is at present, with a minimum price for total amount consumed, regardless of the number of meters, permits the consumer to ask for a meter on each connection, without any extra charge.

During the last year we have metered all new connections to be used for manufacturing and other business purposes together with stores and business places where the assessment was \$9 per year or upwards. Nine dollars being the present minimum price per year for each premise metered we have not placed them on premises where the assessment has been less than that amount in order not to increase the assessment unless the consumption warranted it. But our examiners find a large waste in many places where the assessment is only five or six dollars per year, and I think it would be wise to make a smaller minimum rate so that all such places could be metered.

INSPECTION.

In this department, we still continue the house to house inspection, but with only four examiners instead of five, as last year. About one-third of their time is occupied in reading meters and delivering bills each month. As the work in the meter department increased, one of the examiners was transferred permanently to said department, thinking the four remaining would be able to give all the time necessary for the examination

of leaks, but so much of their time has been taken up in the reading of meters and delivering bills that they have not been able to get over the city twice as in former years, which, I think, accounts for the increased percentage of leaks reported.

They have made 50,288 examinations, reported 3,335 leaks, of which 3,053 were repaired and 282 ordered shut off for failing to comply with notice. The percentage of leaks reported to number of examinations made in 1891 was 4.77 per cent., and in 1892 it was 6.63 per cent., showing that it will be necessary, in order to keep the waste from increasing on unmetered premises, to make at least two examinations throughout the city each year.

The same course has been followed as last year. The occupant has been given a stated time to repair the leak, and at the expiration of said time, if the repairs are not made, the water is ordered shut off, unless it was in two or three cases where the owners were in destitute circumstances and not able to make the repairs, and to have shut the water off would have been cruel. In those cases we made the repairs ourselves with the men employed in the leak department, and at times when they were not busy with other work.

The change made early in the year in regard to plumbers' license—that is, giving all plumbers a first-class license and then holding them to a rigid compliance with our rules and regulations governing plumbers and plumbing—has given good satisfaction to the plumbers and caused everything to move without friction in this department. I think there is better plumbing being done throughout the city than ever before—that is, so far as our inspection extends. As we have nothing to do with the sanitary part of it, we have paid very little attention to that portion of the plumbing, but, from what we have seen, think there is a great field for the proper authorities to labor in. The owners, in most cases, appreciate our efforts to have that portion of the plumbing over which we have control done to our satisfaction, but occasionally we find a person who insists on having his plumbing done to suit himself, regardless of our rules—such as using any kind of lead or iron pipe, putting in

any kind of fixtures and getting the work done by any tinker who comes along, making no report of the work and utterly ignoring the Water Department in every respect. In one particular instance of this kind, after we had notified the owner to have the work changed to comply with our rules, and, he refusing to do so, we attempted to shut the water off from the premises, when, as you are aware, the Water Board was served with an injunction preventing them from interfering with the water on said premises. Until the case comes to trial and is settled, we are not quite sure what rights we have in this matter, but if the Water Board does not have the right to say what material shall be used in the plumbing of buildings, order the necessary changes made when not in compliance with our rules, and also to prohibit any person without license from interfering with the water pipes in any way, then inspection would be a farce and of no earthly benefit. If all rights end at the corporation stop on the lot line, inspection would be of little use, for ninety nine per cent. of the leaks occur between the stop and the different outlets on the premises.

The following table shows the work of the examiners in the eastern and western divisions during the year 1892:

	Examinations	Leaks Reported.	Leaks Repaired.	Ordered Shut Off.
East of Woodward ave.....	25,009	1,871	1,716	153
West of Woodward ave.....	23,279	1,464	1,337	127
Total	50,288	3,335	3,053	280

The following table shows the duties performed by the inspectors of new work during the year 1892:

	Calls for Non-payment.	Shut for Non-payment.	Examined New Connections.	Examined Extensions and Fixtures.	Let on New Connections	Notified for Building Tax.	Shut for Vacancy.
John Hatsenbuehler.....	1,169	285	888	529	211	91	48
Michael Hart.....	1,197	552	68	421	354	70	51
John Becker.....	1,322	428	420	292	226	136	95
C. J. Paterson.....	1,176	497	506	263	377	151	187
John Promstatter.....	896	238	664	501	214	99	29
Adolph Jasnowski.....	1,161	268	500	481	97	40	.....
TOTAL.....	6,861	2,183	3,574	2,487	1,570	607	414

Attached to this report is a complete list of tools on hand, and an itemized account of the material in stock on the 31st day of December, 1892.

In conclusion, I take great pleasure in acknowledging the uniform kindness shown me by your honorable body, and especially by the Secretary, who has upon all occasions so cheerfully given me his careful attention and advice when called upon, and who has so ably conducted the general management of the Works.

The employes under my supervision are entitled to due credit for the faithful performance of their work and their willingness to do duty at all times, either day or night, when called upon so to do.

All of which is respectfully submitted.

T. R. PUTNAM,

Superintendent Meters and Inspection.

REPORT OF SUPERINTENDENT OF GROUNDS.

To the Honorable Board of Water Commissioners:

GENTLEMEN,—As the year 1892 is drawing to a close, it becomes my duty to report to your honorable body progress during the year.

Early in the season, with the prospect of an early settlement of the Hurlbut will, your committee instructed me to beautify the grounds rather more than usual, by planting flowers and improving the roadways, and I am glad to say that the fifty or more flower beds about the grounds assisted very much to make the place attractive.

The number of visitors was largely in excess of that of former years.

The permission of the Board to allow visitors to go about over the lawn was very much appreciated and did not injure the grass during the summer months, excepting some special places, and in my opinion such places, being short cuts, should be made into good gravel paths.

The iron settees were a great convenience, and at times even there were not sufficient of them to supply the large number of visitors present.

The gravel put on the road-beds during the summer was very much needed and improved the appearance of the park wonderfully. No part of the general park work needs closer attention than the roadways, which should always be nicely edged and smoothed. Owing to the heavy loads hauled over our roadways at times, I think it would be a good plan to macadamize the main road from the avenue to the engine house. As the road already has a pretty good foundation of large stones, it would be only necessary to remove the top dressing

and build up in the usual way with stones broken the proper size, side drains being put in at the same time. We could then keep the road in good condition all seasons of the year.

The road sprinkler was not finished in time to be of any use this season, but will be a great benefit the coming summer.

Acting under instructions from your committee, I built a small green house, 12 x 106 feet, at an expense for material of one hundred and eighty-eight dollars. It will be a great convenience, although too small for very extensive floral work.

Now that the Hurlbut will is settled, I would recommend some permanent improvements. One of the first things needed is an iron fence for the Jefferson ave. front. This, I understand, has already been arranged for. It will greatly improve the appearance of the grounds, as the present fence, both in front and on each side, obstructs to a considerable extent the view of the park in approaching and passing it.

Another very much needed improvement is a ladies' toilet room, which I would advise locating south of the tower over the thirty-inch waste pipe.

I would suggest a building with the first floor fitted for the exclusive use of ladies, with a sitting room and toilet rooms, with all the ordinary toilet room fixtures at hand. Then have an outside stairway leading to the top floor for general use, which should be almost entirely glass sides, without partitions or obstructions of any kind, except necessary supports for the roof. A brick building, with stone trimmings, hardwood finish and everything complete, large enough for all purposes, could be built for about twenty-five hundred dollars.

There is also needed very badly a convenient shelter for horses and carriages.

We are now digging a ditch along the west fence from the river to a point four hundred feet south of the engineer's residence, and with three or four cross ditches hope to drain the marsh, so as to stop the growth of flags at least.

There are quite a number of maple trees set in the grounds, some of them several years ago, that will never amount to anything as ornamental shade trees, and I think it would be a good

to put elm trees in the place of them. Maples are attacked by borers more than any other kind of tree in the park. Although we are continually doing what we can to promote the growth of the trees, it seems impossible to get maples to do well.

I am also in favor of planting a number of evergreen trees. Although our generous benefactor, Mr. Hurlbut, did not fancy them, I think it would improve the park very much to have a hundred or so set in clumps about the grounds. Quite a number could be planted along the east line and also a few south of the basin and along the canal bank far enough away so that leaves would not be blown into the basin.

Accompanying this is an invoice of tools, etc., on hand in this department.

Respectfully submitted.

E. A. SCRIBNER,
Superintendent of Grounds.

REPORT OF CHIEF ENGINEER AT PUMPING WORKS.

DETROIT, January 1, 1893.

To the Board of Water Commissioners:

GENTLEMEN—I have the honor to submit the Engineer's report for the year 1892.

The following table shows the number of gallons of water pumped, and cost of fuel for the years named:

YEAR.	GALLONS OF WATER PUMPED.	COST OF FUEL CONSUMED.	AVERAGE DAILY DELIVERED.
1852	235,840,371		646,411
1853	303,531,748	\$2,129 37	931,594
1854	376,365,126	2,271 34	1,080,826
1855	542,807,364	3,325 81	1,487,148
1856	699,124,305	4,017 44	1,858,231
1857	697,190,523	3,903 20	1,909,687
1858	719,091,277	3,655 20	1,967,373
1859	782,112,587	3,194 15	2,142,774
1860	870,036,451	4,196 21	2,393,630
1861	895,129,423	4,414 07	2,462,409
1862	994,945,829	3,150 96	2,725,878
1863	1,035,798,043	4,670 86	2,837,806
1864	1,018,390,256	7,647 62	2,839,078
1865	1,049,514,867	7,372 89	2,875,388
1866	1,196,317,922	9,349 16	3,277,583
1867	1,425,585,230	10,121 82	3,906,576
1868	1,665,545,125	11,379 23	4,507,243
1869	1,946,516,325	11,247 92	4,511,809
1870	1,866,760,668	12,713 78	5,112,493
1871	2,300,150,605	14,681 05	6,301,789
1872	2,782,397,578	17,736 86	7,601,892
1873	3,198,363,948	20,233 80	8,762,723
1874	3,289,872,635	20,471 71	9,013,850
1875	4,207,451,260	21,393 98	11,527,272
1876	4,065,134,470	19,832 89	11,107,499
1877	4,273,239,790	17,433 72	11,548,123
1878	4,845,743,330	10,943 82	11,906,146
1879	5,129,599,110	11,219 51	14,053,696
1880	5,552,965,310	12,276 60	15,172,036
1881	6,343,127,908	16,556 63	17,926,877
1882	6,281,000,742	13,156 16	17,261,410
1883	7,79,321,188	16,495 99	20,217,384
1884	8,510,614,110	19,877 07	23,253,044
1885	9,970,895,880	21,341 48	27,317,841
1886	10,576,571,254	20,837 24	29,978,907
1887	13,164,559,808	35,802 83	36,079,166
1888	14,380,166,670	33,568 66	39,397,116
1889	12,875,434,153	34,413 81	35,274,888
1890	12,120,944,532	31,352 40	33,209,067
1891	12,007,261,226	33,826 86	33,033,592
1892	12,476,612,482	31,031 40	34,182,499

The following tables show in detail the work done by each engine each month of the year.

ENGINE No. 1.

MONTHS	Time run.	Revolutions.	Gallons.	Cost of Kindling.	Pounds of Coal.	Cost of Coal.	Cost of Nat. Gas.	Gallons Fuel Oil.	Cost of Oil.	Total Cost.	Duty.
January	714 10	419,792	324,905.794	\$1 98	130,069	\$203 18	\$407 06			\$912 12	74,655,865
February	394	221,895	173,638.510		37,330	75 41	379 15			434 56	78,647,400
March											
April	316 50	176,836	139,863.921				381 97			381 97	75,706,183
May	342 20	153,479	230,441.392	1 88	1,107	2 35	682 71			682 71	63,0 82
June	530	218,927	353,145.196				1,055 37			1,055 37	74,005,328
July	614 40	396,527	674,503.796				1,226 74	941	\$14 71	1,241 45	70,617,871
August	549 55	267,487	414,038.796		180,062	323 33	68 70	86,088	541 48	933 30	70,753,067
September	211 15	122,719	180,969.012		102,575	207 20		14,084	211 20	418 46	75,683,180
October	399 40	187,368	280,027.188		183,306	370 26		21,830	210 80	680 06	76,841,154
November											
December	440	243,280	198,253.210					23,465	353 27	353 27	77,464,047
Total	1,702 50	2,350,163	2,797,197.062	\$3 76	674 675	\$1,251 63	\$1,343 79	95,904	\$1,459 62	\$7,008 70	

ENGINE No. 2.

MONTHS	Time run.	Revolutions.	Gallons.	Cost of Kindling.	Pounds of Coal.	Cost of Coal.	Cost of Nat. Gas.	Gallons Fuel Oil.	Cost of Oil.	Total Cost.	Duty.
January	353 35	184,236	241,241.908		318,309	\$441 36	\$292 44			\$733 80	74,775,082
February	210	120,552	187,189.968		37,330	75 41	379 15			454 56	78,647,400
March	744	394,328	315,887.068		31,496	102 04	779 62			881 66	78,918,574
April	131 40	74,425	64,664.112		3,164	6 10	173 84			190 70	74,305,260
May	467 45	25,673	377,001.288	\$1 88			193 35			193 35	74,371,389
June	716	46,673	61,234.962				1,704 20			1,704 20	74,682,682
July	614 25	33,312	547,416.012				1,417 68			1,417 68	77,687,169
August	118 45	54,094	43,573.058		17,496	35 15		3,922	\$58 65	101 47	77,687,169
September	231 25	16,144	131,412.102		71,110	123 64		11,749	146 34	269 98	78,687,816
October	195 10	114,944	150,696.526		91,772	191 43		11,050	165 84	357 31	78,687,816
November	375 50	211,257	190,824.098					30,301	308 01	308 01	78,687,816
December	90 25	46,950	50,355.180					1,974	73 04	73 04	77,067,954
Total	4,231 10	2,401,968	2,871,958.960	\$1 88	408,300	\$698 46	\$2,780 11	49,904	\$747 15	\$7,045 51	

ENGINE NO. 3.

MONTHS.	Time run.	Revolutions.	Gallons.	Cost of Kindling.	Pounds of Coal.	Cost of Coal.	Cost of Nat. Gas.	Gallons Fuel Oil.	Cost of Oil.	Total Cost.	Duty.
	A. M.										
January.....	504	305,792	550,407.600	\$1 86	142,073	\$286 89	\$1,209 80			\$1,496 78	74,707.554
February.....	606	365,619	711,009.000		162,972	325 20	1,086 02			1,411 22	76,683.613
March.....	744	400,467	720,894.600		90,814	201 02	1,775 70			1,976 72	78,903.851
April.....	720	386,141	695,065.800		8,870	11 65	1,908 37			1,920 02	73,307.084
May.....	300	192,506	346,510.600	1 86	3,381	6 70	1,019 35			1,026 21	73,705.972
June.....											
July.....	783	414,373	100,871.400				439 25	1,690	\$35 35	474 60	76,655.327
August.....	742	414,101	745,381.600		398,037	581 63	122 90	64,964	974 46	1,656 19	76,590.491
September.....	780	425,068	765,147.000		415,163	638 66		56,969	864 88	1,503 54	76,684.614
October.....	640	333,638	600,580.400		870,240	766 06		44,231	663 32	1,429 38	76,798.827
November.....	780	403,217	725,790.600					80,697	1,345 45	1,345 45	76,683.034
December.....	744	481,105	775,989.000					96,922	1,453 68	1,453 68	76,682.109
Total.....	6,718 30	3,781,937	6,807,486.600	\$3 76	1,496,513	\$3,029 91	\$4,113 26	354,463	\$5,317 24	\$16,457 19	
Aggregate	15,472 30	8,531,796	12,476,612.462	\$9 40	2,624,238	\$5,310 00	\$18,217 18	500,255	\$7,508 92	\$31,081 40	

Fuel consumed.....	\$31,031 40
Salaries, engineers and firemen.....	18,402 42
Coal for pumping oil.....	25 61
Polish.....	25 73
Repairs and materials for repairs.....	8,308 96
Lubricators.....	278 64
Rags, waste, packing, etc.....	123 70
Tools and supplies.....	118 84
Express.....	25
Street car tickets.....	5 00
Stationery and stamps.....	6 80
	<u>\$53,297 89</u>

Cost per million gallons, \$4.27.

Engines One and Two were run part of the time with one pump attached.

It will be seen by the tables the water pumped during the year is but little more than in 1891, although the city has rapidly increased in population. This is accounted for by the stoppage of waste which seems to be more thorough each succeeding year.

With the new triple expansion engine and high pressure boilers which will be ready for use about July, we will be in much better condition to supply the higher districts in the city with a satisfactory head of water, and such additional as to meet any increased demand for some time to come.

In December, 1889, we began the use of natural gas for fuel and continued using it until September of this year. Our experience with natural gas was very satisfactory when the volume was sufficient, but several times it failed so suddenly that we did not have sufficient time to get steam on our cool boilers soon enough, causing a short supply of water for several minutes.

In August we began preparation for the use of fuel oil which we have been using for about three months with the most satisfactory results, being easy to control when properly applied and also a great saving over anthracite coal which has been used nearly since the building of the new works. It was found impracticable to use bituminous coal for the reason that soot would be blown into the settling basin and pumped into the mains.

Our oil burners and connections were put in by the National Supply Company, who furnished burners as good as any we know of. Our boilers being of the fire box marine pattern, it was a question with Engineer Edwards whether the burner should go into the fire box through the furnace doors or under the boiler front which is about fourteen inches below the grate bars used for coal. He, however, decided to put them at the lower point mentioned which has proved too low, for the reason that the intense heat on the lower edge of the side sheets caused such commotion that instead of sediment depositing in the legs of the boiler as before, it has been thrown on the flues and other parts of the boiler where it bakes on, to the injury of the boilers and reducing the duty.

By advising with your committee we concluded to fit up our No. 4 boiler with oil burners set about twenty inches nearer the crown sheet and to arrange a system of bridge walls that would conduct the right volume of air to the exact point needed, and the result has been entirely satisfactory.

We get perfect combustion and also distribute the heat very evenly over the proper heating surface. Another advantage of having our boilers fitted in this way is that we can in a very few minutes change from oil to coal in case of a failure in the supply of the former. I would recommend changing those in the east room for the aforesaid reasons.

For full description of oil plant see secretary's report.

There is a certain property of fuel oil that clings to a pipe through which it flows. It cannot be called sediment for the reason that it forms evenly on the inside surface of the pipe, gradually reducing the opening until the pipe stops up completely, making it necessary to have duplicate lines between the boilers and receiving tank.

We have two duplex pumps with independent suction and a system of pipes and valves so arranged that we can put on full boiler pressure of hot water on either of our supply lines for the purpose of cleaning them out. Hot water is far more effective than steam.

We find that fuel oil should be given as little vent as possible as oil left exposed to the atmosphere will lose its gaseous properties and become thick and almost useless for fuel.

The engines are in fair order with the exception of No. 1 engine which I hope to improve by removing a heavy weight from the fly wheel which was placed there for a balance weight when the engine was built. By placing a proper weight on the pump piston, I am confident the engine will run considerably smoother and easier.

The suction boxes of the three engines are submerged beneath the water, and at the ordinary level in the river have nearly four feet on the boxes. Early this spring, however, the water became so low that it was deemed necessary to guard against possible "loss of priming," by having hoods constructed reach-

ing from the top of the suction boxes to within a foot of the bottom of the well. No further anxiety need be felt therefore even if the water should become four feet below the present level, which is not at all likely.

Repairs on boilers the past year have been considerable, but they are now in fair condition considering their age.

We had four of the Ford mechanical boiler cleaners put on the boilers in the east room June 1st, 1890, and on Oct. 1st, 1890, we had four put on the boilers in the west room. This boiler cleaner is simply a convenient surface blow-off and does not keep the boilers clean as they are represented to do, as we have found it necessary to use considerable boiler compound in order to maintain boilers in condition. I am sorry to say that we have not found as yet any mechanical device that will prevent scale, or any compound that will dissolve scale so that the boilers can be washed out clean, without taking out flues every two or three years.

I would suggest that hereafter all well strainers should be made of the perpendicular bar pattern instead of perforated plate, for this reason: the bar strainer can be thoroughly cleaned without delay. I would recommend having one of this pattern put into the west well where the new connection is to be made. I hope the new discharge connections will be made so that when a new discharge main is laid, either engine can be run independently with either main. The advantage of this is considerable, for the reason that only the required pressure need be kept on each main and the engines could be run slower when required without interfering one with the other, making quite a saving of fuel.

The new addition of forty-seven feet to the west end of the engine house, which is now under way, will make the building look more symmetrical and give ample room for the new engine.

The coal sheds are not in good condition, but as we are not likely to use them for some time, I see no necessity for repairing them immediately as it would be quite an expense.

Respectfully submitted,

URIAH GOULD,

Engineer.

REPORT OF THE SUPERINTENDENT OF EXTENSION AND CONSTRUCTION.

DETROIT, January 2d, 1893.

To the Board of Water Commissioners:

GENTLEMEN: In accordance with the regulations of your Honorable Body, I have the honor to present my annual report relative to the general condition and progress of the work in this department.

During the past season not less than thirty-seven miles of pipe has been laid.

It would seem from the tenor of our last year's report, that the extensions to our pipeage system would be greatly curtailed for the past year, because we expected the calls for extensions in this branch of the work would not be very numerous. We have, however, in this been doomed to disappointment, and although we are condoling ourselves with the hope that the calls upon this department of the work may not be as numerous the coming year, it is nevertheless an unknown quantity. The city now covers an area of about 29 square miles, its greatest length being about $7\frac{1}{4}$ miles, and its width about $5\frac{1}{2}$ miles.

Continually new streets and avenues are being opened, and outside of, and adjacent to the boundary lines of our city are many suburban sections already laid out in streets and building lots, awaiting with gaping mouths for the best of beverages from our source of supply. So in view of these facts, I fear we may not soon get a very long breathing spell; but must keep on our wearing apparel and our hands to the plow. It may be well to say right here, that owing to the great amount of paving being done the past season it has been the cause of much additional work in our extensions.

Among the chief of our lines laid the past year have been the following. The completion of the 24-inch main in the North Boulevard, from Sullivan to the west line of Grand River Avenues, and from this point on said Boulevard a 16-inch main was laid to 14 feet west of the West Boulevard. A 16-inch main was laid in Buchanan Street, from the intersection of the 30 and 24-inch mains in said street and Vine-wood Avenue, to Livernois Avenue, a distance of 5,550 feet, and to which all the streets and avenues have been connected thereto where water mains have been laid, and at such points where new streets have been opened, and where no pipe has as yet been called for, suitable branches have been placed for future use. The gap in the 24-inch main in Cass Street between Fort and Congress Streets was also laid. This completes the line from Fort Street to Jefferson Avenue. A line of 12 and 10-inch pipe has been laid in Gratiot Avenue, with good results. This line was laid from St. Aubin to Rivard Street with the 12-inch pipe, connecting with the 24-inch main in Orleans Street and to all lines crossing the same. The 10-inch pipe was laid from Rivard Street to the intersection of Gratiot avenue, Mullett and Raynor Streets, connecting with the 30-inch in Mullett Street. The laying of this line has greatly relieved the overdrawn pipes and mains in this locality. A 10-inch main was laid in Cleveland Street, from St. Aubin to Elmwood Avenues; and from Elmwood Avenue to Burlage Place, an 8-inch was laid to replace several sections of 3 and 4-inch pipe and wooden logs. This line has made an excellent cross-feed to this section of the city, the 10-inch pipe being connected with the 30-inch main in Chene Street. A line of 8 and 10-inch pipe was laid in Jefferson Avenue from McClelland Avenue to about 800 feet east of the easterly city line and from this a line of 10-inch pipe was laid in the Pumping Works grounds, connecting with the 30-inch main leading to the stand-pipe.

Thirty-one lines of extensions have been made with 8-inch pipe, ranging in lengths from 100 to 3,500 feet, 12 of which were laid to replace wooden logs and 3 and 4-inch iron pipe in

the following streets and avenues: Burlage place, from Cleveland to Waterloo Streets; Calhoun Street, from Chene Street to Grandy Avenue; Eighth Street from Grand River Avenue to Brigham Street; Grandy Avenue, from Gratiot Avenue to Pierce Street; Leland Street, from Dequindre Street to McDougall Avenue; McDougall Avenue, from the north line of Gratiot Avenue to Preston Street; Russell Street, from Congress to Macomb Streets; and from Gratiot Avenue to Maple Street; Sherman Street, from Orleans to Russell Streets; Waterloo Street, from Burlage Place to Mt. Elliott Avenue; Wilkins Street, from Chene to Orleans Streets; and in alley east of Woodward Avenue, north of Gratiot Avenue; 28,985 lineal feet were laid to meet the 31 lines mentioned above, making an average of 935 feet per line.

The laying of new, and extending of the old lines of 6-inch pipe in 166 different places, have averaged about 564 lineal feet per line of pipe, ranging in lengths from 12 to 4,600 feet, or a total length of 93,580 feet.

I find by carefully looking over the records of our pipeage, that 31 new mains of streets and avenues have been added to our list of streets in which pipe has been laid, the same ranging in lengths from 50 to 2,500 feet.

It is quite probable that the calls for pipe the coming season will not exceed 12 inches in diameter as it now presents itself.

It is very gratifying to see the disappearance of some of the smaller lines of pipe, and pipe of much larger size taking its place in many of the streets and avenues of the older portions of our city. Nothing less than 6-inch is being laid north and south, and the preference will be for 8 and 10-inch pipe, seeing it is the wish of your Honorable Body that a bountiful supply shall be had in all portions of the city.

I believe we have good reason to be proud of our pipeage system, as well as the many other things about our works. We have no less than seven main lines running east and west, in sizes from 12 to 36 inches, which are supplied from the two 42-inch mains leading out from Pumping Works, and in ad-

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... mentioned are numerous lines of 8 and 10-
... by the table of pipeage that about four miles
... of pipe have been discontinued or taken
... to pipe of larger size, and where we find the
... the pipe to warrant its relaying, we do so in such
... where we have good reason to believe that only a
... supply will be needed, and where the blocks are not
... also greatly improving our pipe system by shorten-
... ances between the stop-gates in older lines, by a
... quent placing of the said gates, thereby giving less
... to the fewer number, when for any cause it becomes
... to shut off.

RECOMMENDATIONS.

Should the petitions for extensions and the general work of
... department not be as numerous the coming season as in
... immediate past, I would respectfully recommend that the
... lowing lines may be laid for main feeders, and the replacing
... smaller lines of pipe with pipe of larger size.

Appended are some of the locations:

Gratiot Avenue.—A 12-inch pipe from St. Aubin Avenue
to Chene Street. This will connect with the 30-inch main in
Chene Street, distance 1,325 feet.

Crawford Street.—A 10-inch pipe from the 24-inch main in
North Boulevard to Caniff Road, distance 7,800 feet.

Oakland Avenue.—A 10-inch pipe from the 24-inch main in
North Boulevard to the northerly city line, distance 9,000 feet.

Twelfth Street.—A 10-inch pipe from the 24-inch main in
North Boulevard to the northerly city line, distance 5,500 feet.

The three last mentioned lines are for main feeders and to
meet and cure the accumulation of dead ends of the numerous
lines that are laid and are being laid in the streets and avenues
east and west of Woodward Avenue in the new northerly sec-
tion of our city.

Mt. Elliott Avenue.—A 10-inch pipe from Gratiot Avenue to the old city line, distance 8,000 feet, replacing about the same length of 4-inch pipe.

Rivard Street.—An 8-inch pipe from Fourth to Sixth Streets, distance, 750 feet, replacing the same length of 4-inch pipe.

John R Street.—An 8-inch pipe from Piquette Avenue to North Boulevard, distance 1,500 feet, and in said street from Miami to Adams Avenue, distance 900 feet, replacing 650 feet of 4-inch pipe.

Park Street.—An 8-inch pipe from Columbia to Peterboro Streets, distance 3,000 feet, replacing 1,300 feet of 4-inch pipe.

Rivard Street.—An 8-inch pipe from Gratiot to Palmer Avenues, distance 9,700 feet, replacing 8,000 feet of 4-inch pipe. In my recommendations for last year I had recommended the laying of a 12-inch main in this street to be laid from Gratiot Avenue to Watson Street, the purport of which was to meet the overdrawn lines in Gratiot Avenue and contiguous streets. This plan was, however, changed and the line was laid in Gratiot Avenue believing we should gain better results, which has proved to be the case.

Waterloo Street.—An 8-inch pipe from Mt. Elliott to Concord Avenue, distance 1,575 feet, replacing 900 feet of 4-inch pipe. This line is for a cross-feed which will be fed from the 10-inch main in Cleveland Street.

St. Antoine Street.—An 8-inch pipe from Gratiot Avenue to Elizabeth Street, distance 1,100 feet, replacing the same length of 4-inch pipe.

Twelfth Street.—An 8-inch pipe from River Street to Lafayette Avenue, distance 750 feet, replacing the same length of 4-inch pipe; also on said street, from Howard to Baker Streets, distance 1,475 feet, replacing the same length of 4-inch pipe.

Beaubien Street.—An 8-inch pipe from Gratiot Avenue to Watson Street, distance 4,050 feet, replacing the same length of 4-inch pipe.

Holden Avenue.—An 8-inch pipe from North Boulevard to Crawford Street, distance 3,500 feet, replacing 2,100 feet of 4-inch pipe.

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McDougal Avenue.—An 8-inch pipe from Clinton to Gratiot Avenue, distance 4,500 feet.

Hastings Street.—An 8-inch pipe from Farnsworth Street to ~~Wacker~~ Avenue, distance 500 feet; also in said street, from Piquette Avenue to North Boulevard, distance 1,500 feet, replacing 4-inch pipe.

Dubois Street.—An 8-inch pipe from Leland Street to north of Harper Avenue, distance 6,750 feet, replacing 6,000 feet of 4-inch pipe.

Beaufait Avenue.—An 8-inch pipe from 585 feet north of Jefferson to 282 feet north of St. Paul Avenue, distance 2,400 feet, replacing the same length of 4-inch pipe.

Bellevue Avenue.—An 8-inch pipe from Gratiot Avenue to Farnsworth Street, distance 2,100 feet, replacing the same length of 4-inch pipe.

John R Street.—A 6-inch pipe from Erskine to Brady Street, distance 1,050 feet.

Holden Avenue.—A 6-inch pipe from Cass Avenue to Crawford Street, distance 1,900 feet, replacing logs.

Jerome Avenue.—A 6-inch pipe from Milwaukee Avenue to North Boulevard, distance 450 feet, replacing 450 feet of 4-inch pipe.

Piquette Avenue.—A 6-inch pipe from Beaubien to Hastings Street, distance 1,125 feet, replacing 3-inch pipe.

Leib Street.—A 6-inch pipe from Jefferson to Monroe Avenue distance 1,550 feet, replacing 3 and 4-inch pipe.

Brush Street.—A 6-inch pipe from Benton to Brady Street, distance 900 feet.

Adair Street.—A 6-inch pipe from Jefferson Avenue to Guoin Street, distance 1,125 feet, replacing 4-inch pipe.

Walker Street.—A 6-inch pipe from Jefferson Avenue to Atwater Street, distance 1,200 feet, replacing 4-inch pipe.

Twenty-third Street.—A 6-inch pipe from Magnolia to Buchanan Street, distance 1,850 feet, replacing 3 and 4-inch pipe.

Twenty-fifth Street.—A 6-inch pipe from Baker to Howard Street, distance 1,650 feet, replacing 4-inch pipe; also in said

street from Michigan Avenue to E Street, distance 825 feet, replacing 750 feet of 4-inch pipe.

Wabash Avenue.—A 6 or 8-inch pipe from Grand River Avenue to Lake Shore R. R., distance 2,500 feet, replacing log pipe.

Seventeenth Street.—A 6-inch pipe from Poplar to Buchanan Streets, distance 500 feet, replacing 4-inch pipe.

I have, in addition to the above lines, recommended several received from Mr. Tryon, secretary of the Fire Department, which I herewith append:

The first calls for a line of pipe in Elizabeth Street from Cass to Grand River Avenue, distance 435 feet. I see but one objection to this, and that is, it would necessitate the taking up of the new brick pavement in Grand River Avenue. We could, however, lay a 6 or 8-inch pipe in said street from Cass to the north line of Grand River Avenue and leave the end dead for a time.

The second calls for a large main in State street from Washington avenue to Cass street, distance 600 feet. This should be a 10-inch pipe.

The third calls for larger pipe in Park place from Michigan avenue to Grand River avenue. As the block between Michigan avenue and State street is a short one, the better plan would be to run from State to Clifford streets, distance 750 feet. This would connect with the new 10-inch in State street, old 8-inch in Grand River avenue and to a proposed 10-inch which may be laid in Clifford street. This would be an 8-inch line.

The fourth calls for pipe in Bagley avenue from Cass to Park streets, distance 1,050 feet. I think this would be much better met by laying a line of 10-inch pipe in Clifford street from Washington to Adams avenues. This would not only meet Bagley avenue, but Middle street and Adams avenue. This will shorten the 150 feet and will be fed from the 12-inch in Clifford street and the 10-inch in Washington avenue.

The fifth call is for the replacing of the logs in Wabash avenue. This has already been mentioned.

The sixth calls for pipe in Kirby, Warren and Forest avenues,

from Grand River to Cass avenues. The total length is about 20,000 feet, and when laid in this way it will have no special feeders. A much better plan to meet this call would be the laying of a 10 or 12-inch pipe in Commonwealth avenue from the 30-inch main in Brigham street and connecting there to run northerly to Kirby avenue. This distance is about 3,200 feet. And in Kirby avenue, for a cross feeder, lay an 8 or 10-inch pipe from Grand River to Cass avenues, distance 7,800 feet. By laying in this way we have to contend with less pavement, old or new, and will have a much better supply of water and will take 9,000 feet less pipe, all crossings, whether large or small pipe, being connected to these lines and the dead ends cured.

The seventh calls for pipe in Piquette avenue from Lincoln avenue to Twelfth street, distance 1,650 feet. This can be better met by filling the gaps in Trumbull and Commonwealth avenues. This will only require the laying of 1,300 feet.

The eighth calls for pipe in Fort street, from Randolph to St. Antoine streets, distance 1,175 feet; Monroe avenue, from Farrar to St. Antoine streets, distance 1,500 feet, and in Macomb street, from Randolph to St. Antoine streets, distance 1,175 feet. If laid, 6 or 8-inch pipe will answer this call.

The ninth calls for a better supply of water in the vicinity of the D. & M. Junction. This can be met by laying a 10-inch pipe in St. Aubin avenue from Trombly avenue to Pallister road. This will have a direct connection and feed from the 24-inch main in the N. Boulevard, distance 2,250 feet.

The above lines would take about 21 miles of pipe. This is a large amount, and may not be laid the coming season, should it be complied with; and yet not one of the lines mentioned but that should be laid in the very near future.

I am sorry to learn that the Detroit Pipe Foundry has closed its works and possibly may not resume operations again. Our dealings with this firm have been very satisfactory, and the foundry being in our city, it has given us a better opportunity of examining and testing the pipe before delivery by our inspector; and when any changes in our Works have made it

necessary to change the size of our pipe, this has been complied with in a very prompt manner. The closing of the said foundry before our season's work was done has been the cause of some delay in closing up our work for the year, having had to complete our orders for pipe outside of our city.

I take the liberty of placing before the readers of our annual reports a few facts which, I think, may be of special interest to them. They are the following: At the close of the year 1877, and including the work of that year, we had in connection with the Works 104 miles of iron pipe and $89\frac{3}{8}\frac{5}{2}\frac{2}{8}\frac{0}{0}$ miles of log pipe. At the close of the year just passed, it will be seen by the tables of pipeage we have now $426\frac{1}{5}\frac{9}{2}\frac{3}{8}\frac{0}{0}$ miles of iron pipe and only $5\frac{3}{8}\frac{7}{8}\frac{0}{0}$ miles of log pipe, which has quadrupled our iron pipe and lessened the log pipe eighteen fold, and increased the total size of pipe per mileage of all sizes above 4 inches $4\frac{1}{8}$ times greater, or 433 per cent., the greater percentage of which has been for the replacing of logs, 3 and 4-inch pipe and in many of the streets in which no pipe had been laid in the business portions of our city, either for better fire protection or a more bountiful supply of water for manufacturing purposes.

PIPEAGE.

The amount of distribution pipe and mains laid and relaid, and iron and wood pipe discontinued during the past season, is as follows: Total iron pipe laid and relaid $37\frac{2}{3}\frac{2}{3}\frac{2}{3}$ miles, of which 1,495 feet was relaid, and 1,575 feet was laid for private use; $31\frac{6}{8}\frac{6}{8}\frac{6}{8}$ miles of wood and $4\frac{4}{8}\frac{4}{8}\frac{4}{8}$ miles of iron pipe were discontinued, making the net increase of the pipeage $29\frac{3}{8}\frac{3}{8}\frac{3}{8}$ miles. This amount added to the measured lines of iron and wood pipe connected with the Works, will make the total length $431\frac{2}{8}\frac{2}{8}\frac{2}{8}$ miles, of which $426\frac{1}{8}\frac{1}{8}\frac{1}{8}$ miles are iron and $5\frac{5}{8}\frac{5}{8}\frac{5}{8}$ miles are wood pipe, which in detail is as follows:

SIZE OF PIPE IN INCHES.	MEASURED LENGTH IN FEET, FOR 1891.	ADDED LENGTH IN FEET, 1892.	DISCONTINUED LENGTH IN FEET, 1892.	TOTAL LENGTH IN FEET FOR 1892.
45	103	.....	.....	103
42	44,909	.....	.....	44,909
36	715	.....	.....	715
30	49,337	.....	.....	49,337
24	73,278	1,896	.....	75,174
20	461	.....	.....	461
18	87	.....	.....	87
16	26,101	6,218	.....	32,319
12	3,527	3,071	.....	6,598
10	96,423	7,836	.....	104,259
8	189,169	28,985	59	218,095
6	713,339	94,037	1,805	805,571
4	793,543	52,175	13,312	832,406
3	83,940	812	6,397	78,355
2	2,636	184	.....	2,820
TOTAL...	2,077,568	195,214	21,563	2,251,219

During the past year, 739 gates have been set, and 70 re-set; 149 gates were taken out; of the 739 gates set 121 were for blow-offs, 32 were new and 89 old gates. Of the 70 re-set 60 were blow-offs, and of the 149 gates taken out 62 were blow-offs; the balance were replaced with gates of larger size on lines where the small pipe had been replaced with larger lines.

NEW GATES.

NO. OF EACH KIND.	NAME OF GATE.	SIZE.	REMARKS.
6	Murlock Valve Co.....	16	Set.
5	" " ".....	12	"
20	" " ".....	10	"
71	" " ".....	8	"
249	" " ".....	6	"
217	" " ".....	4	"
4	" " ".....	3	"
1	" " ".....	8	Blow off.
5	" " ".....	6	" "
34	" " ".....	4	" "
1	" " ".....	8	" "
3	" " ".....	8 Auto.	Relief
1	" " ".....	8 Flange.	"

OLD GATES.

NO. OF EACH KIND.	NAME OF GATE.	SIZE.	REMARKS.
2	Pittsburgh.....	24	Re-set.
2	Flowers Bros.....	4	"
3	Murlock Valve Co.....	4	"
83	" " ".....	4	Blow off
16	Galvin.....	4	" "
15	Ludlow.....	4	" "
4	Pittsburgh.....	4	" "
31	Flowers Bros.....	4	" "

There are now 4,374 stop-gates in use in the mains, and distribution pipes, ranging in size from 3 to 42 inches, and averaging 1 in 515 feet of pipe. In addition to this number

we have 611 blow-gates, in sizes from 3 to 24 inches. These are not all located at dead ends, but are set at points on our mains, where flushing at times becomes necessary.

The appended table gives the length of 3, 4 and 6-inch pipe, and logs which have been replaced with pipe of larger size, in detail, as follows:

SIZE OF PIPE LAID.	SIZE OF PIPE AND LOGS REPLACED.	LENGTH OF PIPE LAID.
4-inch iron pipe.....	Log pipe.....	8,479 feet.
4 " " ".....	3-inch iron pipe.....	714 "
6 " " ".....	Log pipe.....	4,240 "
6 " " ".....	3-inch iron pipe.....	3,889 "
6 " " ".....	4 " " ".....	4,616 "
8 " " ".....	Log pipe.....	3,839 "
8 " " ".....	3-inch iron pipe.....	1,130 "
8 " " ".....	4 " " ".....	4,351 "
8 " " ".....	6 " " ".....	84 "
10 " " ".....	Log pipe.....	375 "
10 " " ".....	3-inch iron pipe.....	650 "
10 " " ".....	4 " " ".....	682 "
10 " " ".....	6 " " ".....	519 "
TOTAL.....	.....	38,068 "

There were connected with the water mains 324 hydrants and 40 reservoirs, making the total number now in use 2,292 hydrants and 479 reservoirs. One hundred and eighty-six branches were set for the fire department and 433 street branches, ranging in size from 4 to 24 inches.

TABLE OF SERVICE CONNECTIONS.

Number of taps with iron and wood pipe of sizes from $\frac{1}{2}$ inches to 6 inches, in detail as follows :

SIZE OF CONNECTION.	NO. IN 1891.	ADDED IN 1892.	DISCON- TINUED 1892.	TOTAL JANUARY 1, 1893.
Cast iron, 6 inch diameter.....	3	.....	.....	3
" " 4 " "	57	6	.....	63
" " 3 " "	82	16	.....	98
" " 2 " "	84	18	.....	102
" " 1 " "	8,186	993	.....	9,129
" " $\frac{1}{2}$ " "	30,082	2,321	.....	32,003
Wood pipe.....	3,955	22	664	3,313
Mixed sizes.....	1,307	.....	.....	1,307
Grand total.....	44,706	3,576	664	48,618

The following table shows the number of taps made in each ward the past year :

	WARDS.																Totals
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	
New connections, iron pipes, ¾ inch.....	54	31	89	43	116	77	105	120	426	124	201	162	198	153	337	286	2,521
New connections, iron pipes, 1 inch.....	114	81	68	109	51	65	31	57	87	128	34	36	28	22	98	34	993
New connections, iron pipes, 2 inches.....	8	3	8			2					1	1		3	1	1	18
New connections iron pipes, 3 inches.....	5	2		3				2	1				2			1	16
New connections, iron pipes, 4 inches.....	3	1				1								1			6
New connections, log pipes, ¾ inch.....			5	1			1		6	1	4	1	1		1		21
New connections, log pipes, 1 inch.....	1							1									1
TOTALS	179	118	165	156	167	145	137	180	470	253	240	200	229	178	437	322	3,576
Discontinued log connec- tions ¾ inch.....	9	6	56	6	64	28	4	31	238	9	80	23	1			2	607
Discontinued log connec- tions, 1 inch.....	3	5	3	19	2	11			11		2			1			57
TOTALS.....	12	11	59	25	66	39	4	31	299	9	82	23	1	1		2	664

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REPAIRS DEPARTMENT.

The Department of the Works has received its usual prompt attention in the many items of work coming under its care. Over five hundred and seventy-six taps were made and distribution pipes of sizes from five-eighths to four

During the past year, this department has lost its chief foreman in the person of Mr. T. Shaughnessey, who was taken from the ranks by death. He had been in the employ of the Works for over twenty years, and had proved a very valuable

This vacancy has been filled by Mr. John Wallace, who was formerly one of our inspectors. He is filling the position with much credit to himself and the Works. Mr. Wallace's employment with the Works has been of long standing, having had considerable experience in this department.

I am glad to say no very serious breaks have occurred in our large mains the past season. It is true, however, that we have had to take out a defective branch in one of our 42-inch mains at the Pumping Works. This was an abandoned branch, the T end being defective. This was taken out and a straight piece inserted and sleeved up.

PUMPING WORKS.

To facilitate the better working of the engines at the Pumping Works, a 20-inch globe regulator valve was inserted in the 30-inch branch line connecting the two lines of 42-inch mains and the stand-pipe. Prior to this, the adjustment of the engines and mains was made by a partial closing of the 30-inch stop gate on this branch line, the discs of which being loose in the cages carrying them, kept up a continual rattle, and fears were had that the seats would become so defaced, that when needing a perfect shut-off between the mains and stand-pipe we should be unable to do so. It is very gratifying to know that by the placing of this regulator valve it has met our needs. An 8-inch automatic relief valve, with its adjuncts, was attached to this pipe when inserting the said valve.

Engine and Boiler House Extension.—This combination of engine and boiler house is being extended at the west end to give room for the fourth engine and a battery of four boilers. This extension of the engine house proper will give a more symmetrical appearance to the building. It will be remembered that, before this extension, the building had rather a lop-sided appearance, a similar extension having been built on the east side some years ago for the third engine. The original design of the house was for two engines only, and when it should become necessary to add a third engine an additional house should be built on the west half of the grounds. The interior of the engine house proper will have a floor space of 12,937.5 feet. The inside measures 60 x 187.5 feet.

Force Mains.—Plans and specifications have been made for pipe and specials for the connecting of the new No. 4 engine with our two lines of 42-inch mains. The arrangement of the plan for connecting said engine and mains is rather unique, the arrangement being such that this engine can be run in connection with, or independent of, either of the other three engines, and can be used jointly with either of the two mains or otherwise, and when a third main is added, the arrangement is also such that it can be used in the same manner with this third main also. The specials for this work are being made by the Frontier Iron Works, and the 42-inch gates and check-valve, by the Murdock Valve Co.

Conduits.—Plans and specifications have been made for a five-foot cylinder brick conduit. This conduit is to convey the water from the settling basin to the new No. 4 engine. The lower or south end will connect with the west gate and sand strainer well of No. 1 effluent conduit. The upper or north end will connect direct to the suction pipe of said engine. This work will be commenced as soon as the weather will permit.

Messrs. Langley and Jayne have the contract for this work. The box sluice-gate and specials for the same are being made by The Russel Wheel & Foundry Co

Surface Inlet.—No extension was made to this inlet as was recommended. I think this may be delayed for some time, as I have reason to believe that with our three inlets we need not fear any very serious trouble from anchor ice. The combined area of the three equals 76 square feet or nearly 10 feet in diameter.

The laying of the No. 1 inlet pipe which was contracted for in 1891, but which was not quite finished at its close, has been completed the past year.

The plan which Mr. Case mentions in our last year's report, of spanning the settling basin with a wire net-work of strainers, is a good one, and one in which I fully accord, and when I can give it the attention due to its merits, I shall make such plans as may meet this end.

In closing this report it is only courteous to say that the help in the office of my department has been very efficient and the co-operation with the other departments very harmonious.

Transmitted with this report are the locations of the pipes, mains and gates; also inventory of pipe, special castings and tools on hand to January 3, 1893.

Respectfully submitted,

HENRY BRIDGE,

Superintendent of Extension and Construction.

PIPEAGE OF THE CITY OF DETROIT,

ALPHABETED BY STREETS, SHOWING THE KIND AND SIZE OF THE IRON
AND WOOD PIPE NOW IN USE.

LOCATION.	DIAM. INCHES.	KIND.
As st., from Vinewood to Hubbard.....	4	iron.
" e. from Scotten 78 ft.....	4	"
Aberle ave., e. from Russell 349 ft.....	4	"
Abbott st., from Cass to Tenth.....	24	"
" w. from Third 20 ft.....	6	"
" alley s. of, from Cass to w. line of Lognon farm.....	4	"
" alley s. of, crossing Sixth.....	6	"
" alley n. of, from First to Twelfth.....	4	"
Ackley ave., from Gratiot to Center Line rd.....	6	"
Adair st., from 424 ft. s. of Wight to Jefferson.....	4	"
Adams ave., from John R to Randolph.....	6	"
" from Witherell to Hastings.....	4	"
" alley s. of, from 240 ft. e. of Clifford to Cass.....	4	"
" alley n. of, from Woodward to 100 ft. w. of Cass.....	4	"
Adelaide st., from Woodward to Orleans.....	4	"
" e. from Orleans 36 ft.....	18	"
" from 36 ft. e. of Orleans to Gratiot.....	10	"
" crossing Gratiot.....	8	"
Arnes ave., from Field to E. Boulevard.....	4	"
" w. from Crane 215 ft.....	4	"
Alexandrine ave., from Woodward to Cass.....	6	"
" from Cass to Third.....	4	"
" w. from Fourth 150 ft.....	3	"
" e. from Crawford 430 ft.....	4	"
" from Sixth to Seventh.....	4	"
" from Seventh to alley w. of Trumbull.....	6	"
" from alley w. of Trumbull to alley w. of Common- wealth.....	4	"
" crossing Grand River.....	6	"
" from Woodward to w. line of Brush farm.....	4	"
" crossing Brush.....	4	"
" w. from Beaubien 195 ft.....	4	"
" from Beaubien to St. Antoine.....	3	"
" from St. Antoine to Rivard.....	3	wood.
" from Rivard to Russell.....	2½	"
" crossing St. Antoine and Hastings.....	4	iron.
" from Russell to alley w. of Dubois.....	4	"
" from alley w. of Dubois to Chene.....	3	"
" from w. line of Chene to w. line of Grandy.....	4	"
" crossing Grandy.....	3	"
" from alley e. of McDougall to 401 ft. e. of Moran.....	4	"
Alfred st., from Woodward to Russell.....	4	"
" from Russell to Orleans.....	3	"
" from Orleans to Dubois.....	4	"
Alger ave., from 16-inch main to e. line of Woodward.....	6	"

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LOCATION.	DIAM. INCHES.	KIND
Alley s. e. from Woodward 514 ft.	4	iron.
Alley s. e. from Junction 814 ft.	4	"
Alley s. e. crossing Woodward w. side and from e. to. w. line of	4	"
Alley s. e. from Junction 558 ft.	4	"
Alley s. e. from Junction 400 ft.	4	"
Alley s. e. from Rivard to 22 ft. w. of McDougall.	4	"
Alley s. e. crossing Cass and Second.	4	"
Alley s. e. from Second 165 ft.	3	"
Alley s. e. from Twelfth 193 ft.	4	"
Alley s. e. from Wabash 188 ft.	4	"
Alley s. e. from Fourteenth 223 ft.	4	"
Alley s. e. crossing Eighteenth, e. side.	4	"
Alley s. e. from Woodward to Cass.	4	"
Alley s. e. from Gratiot to 275 ft. e. of Jos. Campau.	2 1/4	wood
Alley s. e. crossing Jos. Campau.	4	iron
Alley s. e. from 275 ft. e. of Jos. Campau to alley w. of McDougall.	3	"
Alley s. e. from alley e. of McDougall to Elmwood.	3	"
Alley s. e. from Elmwood to Mt. Elliott.	4	"
Artillery ave., crossing River st. and Fort	6	"
Alley s. from Dix 477 ft.	8	"
Ash st., from Grand River to alley e. of Trumbull.	4	"
Alley s. from alley w. of Trumbull to National.	3	wood.
Alley s. from Harrison to Twelfth.	4	iron.
Alley s. from Twelfth to alley e. of Wabash.	2 1/4	wood.
Alley s. w. from Wabash 178 ft.	4	iron
Alley s. crossing Fifteenth and Sixteenth.	4	"
Alley s. from Sixteenth to Seventeenth.	4	"
Alley s. from Seventeenth to Eighteenth.	3	"
Alley s. crossing Eighteenth to alley w. of	4	"
Alley s. e. from Humboldt 166 ft.	3	"
Alley s. from Humboldt to Sullivan.	4	"
Alley s. from Sullivan 214 ft.	3	"
Alley s. e. from Maybury 250 ft.	4	"
Alley s. from e. line of Tillman to w. line of Twenty fourth.	4	"
Alley s. from Twenty seventh to Vinewood.	4	"
Atwater st., from Griswold to Shelby.	3	"
Alley s. from Griswold to Bates.	6	"
Alley s. from Randolph to 215 ft. e. of St. Aubin.	4	"
Alley s. from 215 ft. e. of St. Aubin to McDougall.	6	"
Alley s. from alley s. of, from alley w. of Bates to Randolph.	4	"
Audrain (in line w. 10) from Copper to Michigan Brass and Iron Works	4	"
Audrain 158 ft.	4	"
Aurelia st., w. from Twelfth 193 ft.	4	"
Avery ave., crossing Grand River.	6	"
Alley s. from alley s. of Lysander to 125 ft. n. of Putnam.	6	"
Alley s. from Merrick to 345 ft. n. of Kirby.	6	"
B st., w. from Vinewood 318 ft.	4	"
Bagg st., from Woodward to Fifteenth.	3 1/4	"
Alley s. from Fifth to Crawford.	3	"
Alley s. crossing Crawford to e. side.	4	"
Bazley ave. from Park to Clifford.	4	"
Alley s. e. of, from alley n. of Park to Cass.	4	"
Alley s. w. of, from 230 ft. n. of Clifford to Grand River.	4	"
Baker st., from Seventh to Twenty-fourth.	3	"
Alley s. from Seventh to Eighth.	4	"

LOCATION.	DIAM. INCHES.	KIND.
Baker st., from Twenty-fourth to Vinewood.....	4	iron.
" crossing Twenty-fifth and Vinewood e. side 29 ft.....	6	"
" from Hubbard to Scotten.....	4	"
" alley s. of, from Wabash to Fourteenth.....	4	"
Baldwin ave., from Jefferson to Kercheval.....	6	"
" from Mack to Warren.....	10	"
" from Gratiot to Center-line rd.....	8	"
Baltimore ave., from Woodward to w. line of Crawford.....	4	"
" w. from Sullivan 297 ft.....	4	"
" crossing Brush w. side 38 ft.....	4	"
" from Woodward to w. line of Brush.....	3	"
Bates st., from Atwater to Farmer.....	6	"
" from Congress to Champlain.....	30	"
Beacon st., from Brush to 211 ft. e. of St. Antoine.....	4	"
Beaubien st., from Atwater to Clinton.....	6	"
" crossing Champlain.....	8	"
" from Clinton to Watson.....	4	"
" from Watson to Harper.....	10	"
" from Harper to s. line of n. Boulevard.....	6	"
" from s. line of n. Boulevard to n. line of same.....	10	"
Beaufait ave., n. from Jefferson 585 ft.....	6	"
" from 585 ft. n. of Jefferson to 283 ft. n. of St. Pau.....	4	"
" from 282 ft. n. of St. Paul to 263 n. of Kercheval.....	6	"
" from Mack to 293 ft. s. of Gratiot.....	6	"
" from Gratiot to 190 ft. n. of Forest.....	6	"
" crossing n. Boulevard.....	6	"
Beaver st., from Twenty-seventh to Vinewood.....	4	"
Beech st., from First to Seventh.....	4	"
Bellair st., from Riopelle to St. Aubin.....	2½	wood.
" e. from St. Aubin 300 ft.....	4	iron.
" w. from Dubois 100 ft.....	3	"
" crossing Dubois and Chene.....	4	"
" from Dubois to Grandy.....	3	"
" from Grandy to Jos. Campau.....	2½	wood.
" e. from McDougall 402 ft.....	4	iron.
Belle Isle ave., from Parker to 250 ft. n. of Coe.....	6	"
Bellevue ave., from Jefferson to s. line of Superior.....	6	"
" crossing Gratiot.....	6	"
" from Gratiot to 30 ft. s. of Farnsworth.....	4	"
" crossing n. Boulevard.....	8	"
Belmont ave., from 16-in. main to e. line of Woodward.....	6	"
Benton st., from Brush to Russell.....	4	"
Berlin st., from Gratiot to Jos. Campau.....	3	"
" from Jos. Campau to alley w. of McDougall.....	2½	wood.
" crossing Joseph Campau and Elmwood.....	4	iron.
" from alley e. of McDougall to Elmwood.....	3	"
" from Ellery to Mt. Elliott.....	4	"
Biddle st., from Twenty-seventh to 190 ft. e. of Vinewood.....	4	"
Blaine ave., from 16-inch main to w. line of Woodward.....	6	"
" w. from Woodward 1616 ft.....	4	"
Boose st., crossing Collins.....	6	"
" w. from Collins 314 ft.....	4	"
" w. from Moran 284 ft.....	4	"
" crossing E. Boulevard, e. side 81 ft.....	6	"
Boulevard East, e. side, from 255 ft. s. of Jefferson to Congress.....	6	"
" e. side, s. from Agnes 121 ft.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Boulevard East, w. side, from Jefferson ave. main to n. line.....	6	iron.
" w. side, n. from St. Paul 52 ft.....	6	"
" both sides, crossing Mack n. side.....	4	"
" e. side, s. from Gratiot 30 ft.....	4	"
" w. side, crossing Farnsworth and Ferry.....	8	"
" e. side crossing Farnsworth and N Boulevard.....	6	"
" w. side, crossing N. Boulevard.....	8	"
Boulevard North, n. side, crossing Frontenac.....	6	"
" both sides, crossing Helen, Canton and Concord.....	6	"
" both sides, crossing Bellevue, Beaufait and Meldrum..	6	"
" both sides, crossing Mt. Elliott, Ellery and Moran.....	6	"
" both sides, crossing Collins.....	6	"
Boulevard East, both sides crossing Hendrie, Medbury and Piquette....	6	"
" e. side, crossing Harper, Boone and Kanter.....	6	"
Boulevard North, from Collins to Grand River.....	24	"
" from Grand River to 14 ft. w. of w. Boulevard.....	16	"
" s. side, from Woodward to 100 ft. e. of Rivard.....	4	"
" n. side, crossing Woodward.....	6	"
" n. side, e. from Grand River 600 ft.....	4	"
" s. side, crossing Cass and Fourteenth.....	4	"
" s. side, crossing Crawford, e. side.....	4	"
" both sides crossing Eighteenth.....	4	"
" s. side, from e. line to 361 ft. w. of Twelfth.....	4	"
" s. side, from e. line of Grand River to e. side of W. Boulevard.....	4	"
Boulevard West, e. side s. from N. Boulevard 161 ft.....	4	"
" w. side s. from N. Boulevard 117 feet.....	6	"
" both sides crossing Buchanan.....	6	"
" from alley e. of Twenty-seventh to Hubbard.....	6	"
" from Myrtle to Michigan.....	6	"
" w. side s. from Michigan 256 ft.....	4	"
" from 327 ft. s. of Toledo to Dix.....	6	"
" e. side from Dix to Baker.....	6	"
" w. side from Baker to Shady Lane.....	3	"
" both sides from Shady Lane to Fort.....	4	"
Bowen ave., from Jefferson to 177 ft. n. of Pontiac.....	6	"
Brady st., from Woodward to Beaubien.....	6	"
" from Beaubien to Russell.....	4	"
Brainard st., from Cass to Third.....	4	"
" from Third to alley w. of.....	24	wood
" from Fourth to alley w. of.....	4	iron
" from alley w. of Fourth to Crawford.....	3	"
" from Sixth to Seventh.....	4	"
" from e. line of Seventh to Trumbull.....	6	"
Brandon ave., from Hubbard to Junction.....	4	"
Bratshaw st., from Third to Fourth.....	24	wood
Breckenridge st., w. from Fourteenth 140 ft.....	4	iron
" from 143 ft. e. of Seventeenth to Eighteenth.....	4	"
" w. from Humboldt 74 ft.....	4	"
Brevoort pl., from alley w. of Eighteenth to Nineteenth.....	4	"
" crossing Twenty-second.....	4	"
" e. from Twenty-second 240 feet.....	24	wood
Brewster st., from Brush to Russell.....	4	iron
" from Riopelle to Gratiot.....	4	"
Brigham st., from Third to Grand River.....	20	"
" from Fourth to Eighth.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Brigham st., crossing Lincoln and Twelfth.....	4	Iron.
" e. from Twelfth 196 ft.....	4	"
Bristol pl., from Twenty-first to Twenty-second.....	4	"
Brush st., from Atwater to Jefferson.....	6	"
" from Jefferson to Congress.....	4	"
" from Congress to Gratiot.....	8	"
" from Gratiot to Wilkins.....	4	"
" from Edmund to Watson.....	24	"
" from Watson to Benton.....	6	"
" crossing Eliot and Rowena.....	4	"
" from Alexandrine to 106 ft. s. of Piquette.....	6	"
" from s. line of Piquette to 106 ft. n. of Trombly.....	6	"
" s. from Baltimore 109 ft.....	6	"
" n. from Baltimore 280 ft.....	8	"
" from 280 ft. n. of Baltimore to 251 ft. n. of Milwaukee.....	4	"
" from 251 ft. n. of Milwaukee to 24-inch main in N. Boulevard.....	8	"
" from Horton to Hamlin.....	4	"
" crossing Chandler.....	6	"
Bryant st., w. from Twelfth 188 ft.....	4	"
Buchanan st., from Grand River to Vinewood.....	30	"
" from Vinewood to Livernois.....	16	"
" from Wabash to Fifteenth.....	4	"
" w. from Seventeenth 169 ft.....	4	"
" from Eighteenth to 287 ft. w. of Humboldt.....	4	"
" from 75 ft. e. of Sullivan to e. line of Maybury.....	3	"
" from e. line of Maybury to Williams.....	4	"
" from Twenty-third to w. line of Twenty-fourth.....	4	"
" from Scotten to Twenty-eighth.....	4	"
" alley s. of, from Joe to Howell.....	6	"
Burlage pl., from Waterloo to Cleveland.....	8	"
Bushey st., from Michigan to Julia.....	6	"
Butternut st., from Seventh to alley e. of Trumbull.....	4	"
" from alley w. of Trumbull to National.....	4	"
" e. from Wabash 263 ft.....	4	"
" e. from Seventeenth 144 ft.....	4	"
" from 227 ft. e. of Maybury to Williams.....	4	"
" from Fifteenth to Twenty-fourth.....	24	"
C st., from Vinewood to Hubbard.....	4	"
Cadillac ave., from pumping works to Mack.....	42	"
" crossing Jefferson to n. line.....	6	"
" from 1,000 ft. n. to 2,050 ft. n. of Jefferson ave.....	6	"
Cadillac square, s. side, from Woodward to Randolph.....	24	"
" n. side, from Monroe to Bates.....	6	"
" alley n. of from alley w. of Bates to Randolph.....	4	"
Calhoun st., from Brush to Russell.....	4	"
" w. from Riopelle 159 ft.....	4	"
" from Dequindre to w. line of Chene.....	4	"
" from w. line of Chene to Grandy.....	8	"
Cameron ave., from 24 inch main to 122 ft. n. of N. Boulevard.....	6	"
" from 122 ft. n. of N. Boulevard to Pallister.....	4	"
" from Pallister to 22 ft. n. of Koch.....	6	"
Campan st., from River st. to Fort.....	6	"
" n. from Dix 448 ft.....	4	"
Campbell ave., from River st. to Driggs.....	6	"
" from 224 ft. s. of Fort to Celeron.....	6	"
" from s. line of Dix to 62 ft. n. of McMillan.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Campbell ave., from Romeyn to Dunn.....	6	iron.
" from Jackson to 161 ft. n. of Herbert.....	6	"
Canfield ave., from Woodward to Third.....	30	"
" from Woodward to Third.....	4	"
" from Fourth to Crawford.....	4	"
" from Sixth to e. line of Seventh.....	3	"
" crossing Seventh.....	4	"
" from Twelfth to 48 ft. e. of Thirteenth.....	3	"
" e. from Thirteenth 48 ft.....	4	"
" from Woodward to Collins.....	42	"
" from Woodward to 767 ft. w. of Mt. Elliott.....	6	"
" w. from Mt. Elliott 767 ft.....	4	"
" alley s. of, e. from Hastings 331 ft.....	3	"
" alley n. of, e. from Hastings 335 ft.....	3	"
" alley n. of, e. from Second 150 ft.....	3	"
Caniff ave., from 16-in. main to w. line Woodward.....	6	"
" w. from Woodward 27 ft.....	4	"
Canton ave., from Jefferson to 210 ft. n. of Kercheval.....	6	"
" crossing Mack.....	6	"
" s. from Gratiot 1,059 ft.....	6	"
" from 93 ft. s. of, to 118 ft. n. of Farnsworth.....	6	"
" crossing N. Boulevard.....	6	"
" s. from Piquette 266 ft.....	6	"
Caroline st., w. from Twelfth 192 ft.....	3 & 4	"
Cass st., from Woodbridge to Jefferson.....	8	"
" from Jefferson to Fort.....	24	"
" from alley n. of Michigan to Spencer.....	4	"
" alley w. of, from alley n. of Adams to 119 ft. s. of Gilman.....	4	"
" alley w. of, s. from Gilman 119 ft.....	3	"
Cass st. and ave., from Jefferson to Joy.....	10	"
Cass ave., from Joy to Alexandrine and crossing Canfield.....	8	"
" from Alexandrine to 118 ft. s. of D. & B. C. R. R.....	6	"
" from 118 ft. s. of D. & B. C. R. R. to Milwaukee.....	8	"
" from s. line of N. Boulevard to 24-in. main.....	8	"
" west side, crossing Forest and Putnam.....	4	"
" alley w. of, from Ledyard to Bagg.....	4	"
Catherine st., from Gratiot to Rivard.....	4	"
" crossing Rivard.....	6	"
" from Rivard to Dequindre.....	4	"
" from Dequindre to St. Aubin.....	3	"
" from St. Aubin to Elmwood.....	4	"
Cavalry ave., from 416 ft. s. of Cadet to n. line of Dix.....	6	"
" from n. line of Dix to Toledo.....	4	"
Coleman st., from Junction to 274 ft. w. of Campbell.....	4	"
Columbia st., from Twelfth to Thirteenth.....	4	"
" from Thirteenth to Wabash.....	3	"
Center-Line rd., from Baldwin to Vandyke.....	6	"
Champlain st., from Randolph to St. Aubin.....	30	"
" from Randolph to alley e. of.....	4	"
" from St. Antoine to Orleans.....	4	"
" from Orleans to Elmwood.....	6	"
" from Elmwood to 260 ft. w. of Lieb.....	4	"
" w. from Lieb 260 ft.....	3	"
" from Lieb to Field.....	4	"
" crossing E. Boulevard.....	6	"
" from Field to e. line of Baldwin.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Champlain st., w. from Crane 238 ft.....	4	iron.
" alley n. of, from Brush to St. Antoine.....	4	"
Chandler ave., from Woodward to w. line of Oakland.....	6	"
Charles J. ave., from Holcomb to McClellan.....	4	"
Charles st., from Sixth to Seventh.....	4	"
Charlevoix st., from Chene to e. line of Jos. Campau.....	4	"
" from Jos. Campau to alley w. of McDougall.....	3	"
" from alley e. of McDougall to Elmwood.....	4	"
" from Ellery to Mt. Elliott.....	4	"
" w. from Concord 142 ft.....	4	"
Charlotte ave., from Woodward to alley e. of Third.....	4	"
" w. from Fourth 181 ft.....	3	"
" e. from Fifth 180 ft.....	4	"
Chase st., from alley e. of Russell to e. line of Riopelle.....	3	"
" crossing Russell e. side and Riopelle w. side.....	4	"
Chene st., from Congress to Canfield.....	30	"
" from Atwater to N. Boulevard (s. line).....	6	"
Cherry st., from Grand River to alley w. of Trumbull.....	4	"
" from alley w. of Trumbull to National.....	3	"
" from Harrison to Twelfth.....	4	"
Chestnut st., from Russell to Elmwood.....	4	"
Chipman st., from alley w. of Eighteenth to Nineteenth.....	4	"
Chope pl., s. from Grand River 167 ft.....	4	"
Christiancy st., e. from Lansing 134 ft.....	4	"
Church st., crossing Tenth to 170 ft. w.....	4	"
" crossing Eleventh.....	4	"
" alley s. of, from Eighth to Tenth.....	4	"
Clairmont ave., from 16 in. main to w. line of Woodward.....	6	"
" w. from Woodward 1,275 ft.....	4	"
Clark ave., from River st. to Fort.....	8	"
" from 1,000 ft. n. of Fort to s. line of M. C. R. R.....	8	"
" from s. line of M. C. R. R. to Michigan.....	6	"
" from Mich. Pen. Car Wks to Michigan.....	4	"
" in car works' grounds.....	6	"
Clark park, w. from Scotten 292 ft.....	4	"
" e. from Clark ave. 232 ft.....	4	"
" n. and s. from 4-in. pipe 607 ft.....	3	"
Cleveland ave., from e. line of Woodward to Crawford.....	6	"
Cleveland st., from St. Aubin to Elmwood.....	10	"
" from Elmwood to Burlage pl.....	8	"
Cleveland place, crossing Crawford e. side.....	4	"
" e. from Crawford 264 ft.....	3	"
" alley n. of, crossing Crawford e. side.....	4	"
" alley n. of, from Crawford to alley w. of Fourth.....	3	"
Clifford st., from e. line of Woodward to Washington.....	12	"
" from alley w. of Griswold to e. line of Washington.....	4	"
" from Park pl. to Sproat.....	4	"
Clinton st., from Gratiot to Rivard.....	10	"
" from Rivard to Orleans.....	16	"
" st. and ave., from Orleans to Elmwood.....	8	"
" w. from Crane 211 ft.....	4	"
Clippert st., n. from Dennis 481 ft.....	4	"
Coe ave., from Van Dyke to Belle Isle.....	6	"
Colby ave., crossing Russell e. side.....	4	"
Collins st., from Gratiot to Canfield.....	42	"
" from Canfield to Griffin.....	30	"

LOCATION.	DIAM. INCHES.	KIND.
Collins st., from Leland to Canfield	4	iron.
" n. from Canfield 568 ft.	3	"
" from 563 ft. n. of Canfield to 26 ft. n. of Hancock.....	4	"
" a. from Harper 150 ft.	6	"
Columbia st., from Woodward to Cass.....	4	"
" from Woodward to John R.	6	"
" from John R. to Beaubien.	4	"
" from Beaubien to Rivard	6	"
" alley s. of, from Woodward to Cass.	6	"
Columbus ave., s. from Fort 570 ft.	3	"
" crossing Fort.	4	"
Commonwealth ave., from Alexandrine to 57 ft. s. of Brigham.....	6	"
" crossing Grand River.	6	"
" from s. line to 168 ft. n. of Putnam.....	6	"
" from Kirby to 7 ft. n. of Stanley.....	6	"
" from 499 ft. s. of Piquette to Holden.....	6	"
Company ave., from 67 ft. s. of, to 307 ft. n. of Lorman.....	6	"
Concord ave., from Jefferson to 110 ft. n. of Waterloo.....	6	"
" from 290 ft. s. of Charlevoix to Mack.....	6	"
" from Sylvester to s. line of Center Line rd.	6	"
Congress st., from Bates to Sixth.....	20	"
" from Randolph to St. Aubin.....	24	"
" from St. Aubin to Meldrum.....	42	"
" from Bates to Brush.....	4	"
" from St. Antoine to Mt. Elliott.....	4	"
" w. from Helen 171 ft.	4	"
" from e. side of E. Boulevard to Field.....	4	"
" alley s. of, from Griswold to Third.....	4	"
" alley s. of, e. from Fourth 260 ft.	4	"
" alley s. of, from Sixth to Seventh.....	4	"
" alley s. of, from 80 ft. e. of Brush to St. Antoine.....	4	"
" alley n. of, from alley w. of Woodward to Shelby.....	4	"
" alley n. of, from Shelby to Cass.....	6	"
" alley n. of, from Cass to 10 ft. w. of Third.....	4	"
" alley n. of, from Fifth to Seventh.....	6	"
" alley n. of, from Seventh to Eighth.....	4	"
" alley n. of, from alley e. of Woodward to Bates.	4	"
" alley n. of, from alley w. of Brush to St. Antoine.....	4	"
" alley n. of, from alley e. of Woodward e. 94 ft.	3	"
Craig ave., n from Trombly 378 ft.	3	"
Crane ave., from Jefferson to Mack.....	6	"
" from 380 ft. s. of Hendrie to 800 ft. s. of Gratiot.....	6	"
" from 800 ft. s. of Gratiot to s. line of Center Line rd.	6	"
Crawford st., from Bagg to Lothrop.....	6	"
" n. from Lothrop 3,984 ft	4	"
" crossing Brigham.....	8	"
" crossing N. Boulevard.....	10	"
Cross st., alley n. of, from John R to Randolph.....	4	"
Crystal st., from Trombly to Milwaukee.....	4	"
Custer ave., e. from Woodward 268 ft.	4	"
" e. from John R 215 ft.	4	"
" from Brush to Hastings.....	4	"
" e. from Rivard 126 feet.....	4	"
" w. from Jos. Campau 433 ft.	4	"
Cutler st., e. from McClellan 481 ft.	4	"
D. st., w. from Vinewood 300 ft.	4	"

LOCATION.	DIAM. INCHES.	KIND.
Dalselle st., crossing Twelfth st.....	4	iron.
" from Twelfth to Thirteenth.....	3	"
" from Foundry to Twenty-second.....	4	"
" from Twenty-third to Twenty-fourth.....	4	"
Dane st., crossing Collins e. side.....	6	"
" from e. line of Collins to 338 ft. e. of Moran.....	4	"
Davenport st., from Woodward to Cass.....	4	"
Davis Place, s. from Theodore 260 ft.....	3 1/4	wood.
Dennis st., from Liversols to Clippert.....	4	iron.
Dequindre st., from Woodbridge to Jefferson.....	6	"
" w. side from Jay to Waterloo.....	4	"
" e. side from Waterloo to Gratiot.....	4	"
" s. from Adelaide 206 ft.....	4	"
" from Alfred to Pierce.....	4	"
" from Canfield to Willis.....	4	"
Detloff court, n. from Hancock 12 ft.....	4	"
" from 12 ft. n. of Hancock to 270 ft. n.....	3	"
Division st., from Brush to St. Aubin.....	4	"
Dix ave., crossing Twenty-third.....	6	"
" from Twenty-fourth to Artillery.....	10	"
Dragoon ave., n. from River st. 563 ft.....	6	"
" from s. line of Fort to n. line of Dix.....	6	"
Driggs ave., from Junction to Campbell.....	4	"
Dry Dock st., from Swain to Lady's lane.....	4	"
Dubois st., from Atwater to Clinton.....	6	"
" from Clinton to Hunt.....	8	"
" from Hunt to n. line of Leland.....	6	"
" from n. line of Leland to Canfield.....	3	"
" from Canfield to 188 ft. n. of Frederick.....	4	"
" from 188 ft. n. of Frederick to Ferry.....	6	"
" from Ferry to 338 ft. n. of Palmer.....	4	"
" from 100 ft. s. of Medbury to 20 ft. s. of Harper.....	4	"
" from 20 ft. s. of Harper to 102 ft. n. of Piquette.....	8	"
" crossing N. Boulevard.....	8	"
Duffield st. from Woodward to Cass.....	4	"
Dumontier ave., e from Crane 297 ft.....	4	"
Dunn st., from Campbell to Wesson.....	6	"
E st., w. from Vinewood 416 ft.....	4	"
E st., from Twenty-sixth to e. line of W. Boulevard.....	4	"
Edmund pl., from Woodward to Brush.....	24	"
Eighth st., from River st. to alley s. of Fort.....	4	"
" from Fort to alley n. of.....	2 1/4	wood.
" from Baker to Cherry.....	4	iron.
" from Grand River to Brigham.....	8	"
" crossing Brigham s. 40 ft.....	6	"
" from Brigham to Lysander.....	4	"
Eighteenth st., from Fort to 50 ft. n. of Linden.....	6	"
" from 50 ft. n. of, to 270 ft. n. of Linden.....	3	"
" from 270 ft. n. of, to 468 ft. n. of Linden.....	4	"
" from 468 ft. n. of Linden to Buchanan.....	6	"
" crossing Myrtle.....	8	"
" from Buchanan to 369 ft. n. of Breckenridge.....	4	"
" from Grand River to s. line of N. Boulevard.....	6	"
" crossing N. Boulevard.....	8	"
" n. of N. Boulevard 228 ft.....	6	"
" alley w. of, from Brevoort to Webster pl.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Fifth ave., from 16-inch main to w. line of Woodward.....	6	iron.
“ w. from Woodward 182 ft.....	4	“
Fifth st., from Congress to alley n. of.....	8	“
“ from alley s. of to alley n. of Lafayette.....	4	“
“ from Labrosse to alley n. of.....	4	“
“ from Michigan to Noble	4	“
“ both sides of Elton and Crawford parks.....	4	“
“ from Holden to 144 ft. s. of Piquette.....	4	“
Fifteenth st., from Fort to n. line of Grand River.....	6	“
“ from Bagg to Buchanan.....	24	“
“ n. from Warren 348 ft.....	6	“
“ from s. to n. line of N. Boulevard.....	6	“
First st., from Front to Jefferson	6	“
“ from Jefferson to alley n. of and crossing Congress.....	8	“
“ from Woodbridge to Fort.....	4	“
“ from Fort to Grand River.....	6	“
“ alley e. of from alley n. of Michigan to Spencer.....	4	“
Fischer ave., from Jefferson to 118 ft. n. of St. Paul.....	6	“
Fletcher st., w. from Weason 238 ft.....	4	“
Florence st., from Harper to Piquette.....	4	“
Flower st., n. from Forest 280 ft.....	3 & 4	“
Forest ave., from Woodward to Cass.....	4	“
“ both sides from Cass to Third.....	4	“
“ from Fourth to Seventh and crossing Trumbull.	4	“
“ from Avery to 190 ft. w. of Twelfth.....	4	“
“ from Woodward to 824 ft. w. of Rivard.....	4	“
“ from Russell to 377 ft. e. of Chene.....	4	“
“ w. from Grandy 225 ft.....	2¼	wood.
“ crossing Collins.....	6	iron.
“ from Collins to Moran.....	4	“
“ from 194 ft. w. of Ellery to Mt. Elliott.....	4	“
“ w. from Beaufait 157 ft.....	4	“
“ w. from Baldwin 164 ft.....	4	“
“ alley n. of, from Orleans to alley e. of Riopelle.....	3 & 4	“
Fort st., from Woodward to Griswold.....	4	“
“ from Woodward to Seventh.....	16	“
“ from Seventh to Fourteenth.....	6	“
“ from Fourteenth to Hoffman.....	8	“
“ from Hoffman to Twenty-fourth.....	6	“
“ from Twenty-fourth to w. line of Artillery.....	8	“
“ from St. Antoine to Meldrum.....	4	“
“ w. from Helen 168 ft.....	4	“
“ alley n. of, w. from Brush 135 ft.....	2¼	wood
“ alley n. of, from Brush to St. Antoine.....	4	iron.
Foundry st., from Baker to Michigan.....	6	“
Fourth st., from Woodbridge to Larpud.....	4	“
“ from Larned to Congress.....	8	“
“ from Fort to Grand River.....	6	“
Fourth ave., from Grand River to Bagg.....	4	“
“ from Bagg to Brigham.....	6	“
“ from Brigham to Holden.....	4	“
“ alley w. of, from Brainard to alley n. of.....	4	“
“ alley w. of, from Selden to alley s. of.....	4	“
“ from 16-in. main to w. line of Woodward.....	6	“
Fourteenth ave., from Fort to Lafayette.....	8	“
“ w. side, n. from Porter 402 ft.....	4	“

LOCATION.	DIAM. INCHES.	KIND.
Fourteenth ave., from Lafayette to Bagg.....	10	iron.
" from Bagg to Grand River.....	8	"
" from Grand River to s. line of N. Boulevard.....	6	"
" from s. to n. line of N. Boulevard.....	8	"
Fox st., from Frank to Alexandrine.....	3 & 4	"
Frank st., from Fourth to 114 ft. w. of Sixth.....	4	"
" from 114 ft. w. of Sixth to alley e. of Seventh.....	3	"
Franklin st., from Randolph to Beaubien.....	4	"
" from Beaubien to Orleans.....	6	"
" from Orleans to 25 ft. e. of Dequindre.....	4	"
" from 25 ft. e. of Dequindre to McDougall.....	6	"
" from Walker to Adair.....	4	"
" crossing Lieb w. side.....	4	"
" w. from Lieb 310 ft.....	2 1/4	wood.
" alleys n. and s. of, from McDougall to Walker.....	4	iron.
Frederick st., from Woodward to 194 ft. e. of Riopelle.....	4	"
" from 268 ft. w. of St. Aubin to Jos. Campau.....	4	"
" crossing Collins.....	6	"
" from Helen to E. Boulevard.....	4	"
" from Baldwin to Van Dyke.....	4	"
Front st., from 170 ft. e. of First to Second.....	4	"
" e. from Third 107 ft.....	6	"
" alley n. of, from Second to Third.....	4	"
Frontenac ave., from 8-in. main to n. line of N. Boulevard.....	8	"
" s. from Medbury 98 ft.....	6	"
Gallagher pl., from Crawford to alley w. of Fourth.....	4	"
Garfield ave., from Woodward to w. line of Brush farm.....	4	"
" crossing Brush.....	4	"
" from 255 ft. w. of Beaubien to e. line of St. Antoine.....	4	"
" w. from Hastings 359 ft.....	3	"
" from Hastings to 47 e. of Chene.....	4	"
" from 47 ft. e. of Chene to Grandy.....	3	wood.
" crossing Grandy.....	4	iron.
" e. from McDougall 218 ft.....	4	"
" crossing Collins.....	6	"
" w. from Moran 218 ft.....	4	"
" w. from Beaufort 182 ft.....	4	"
" alley s. of, w. from Hastings 359 ft.....	4	"
Hilbert st., e. from Scotton 308 ft.....	4	"
Gilman st., from Cass to Grand River.....	4	"
Gladstone ave., from 16-inch main to 735 ft. w. of Woodward.....	6	"
" st., w. from Twenty-seventh 105 ft.....	4	"
" crossing Vinewood e. side.....	4	"
Glynn court, from 16-inch main to w. line Woodward.....	6	"
" w. from Woodward 300 ft.....	4	"
Goehe st., e. from McClellan 238 ft.....	4	"
Goldner ave., from Michigan ave. to G. T. Ry.....	6	"
Grand River ave., from Woodward to Cass.....	8	"
" from Cass to Third.....	6	"
" from Third to 400 ft. w. of Humboldt.....	8	"
" from 400 ft. w. of Humboldt to Vinewood.....	6	"
" from Vinewood to N. Boulevard.....	10	"
" from N. Boulevard to city limits.....	6	"
" from Brigham to Buchanan.....	20	"
" connecting 8-inch to 30-inch mains in Buchanan 22 ft.....	8	"
" s. side, from Second to 55 ft. e. of Cherry.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Grand River ave., n. side e. from Eighth 110 ft	8	iron.
" alley n. of, from 10 ft. w. of Bagley to alley w. of.....	4	"
" alley n. of, from Fourth to Union.....	4	"
" alley n. of, w. from Lincoln 47 ft.....	4	"
" alley n. of, from 47 ft. w. of Lincoln to alley w. of.....	3 1/4	wood.
" alley n. of, from Trumbull to alley w. of.....	6	iron.
Grandy ave., from Gratiot to Pierce.....	8	"
" from Pierce to Harper.....	6	"
" n. from Harper 322 ft.....	4	"
" from 322 ft. n. of Harper to Chene.....	6	"
Grant court, n. from Warren 313 ft.....	4	"
Grant st. crossing Twelfth w. side.....	4	"
" from Twelfth to Thirteenth.....	3	"
Granville pl., from Thirteenth to Wabash.....	3	"
" crossing Wabash e. side.....	4	"
Gratiot ave., from Woodward to Raynor.....	30	"
" from Woodward to Brush.....	10	"
" from Brush to 64 ft. w. of Sheridan.....	6	"
" from 64 w. of Sheridan to 266 ft. w. of Butler.....	8	"
" w. from Butler 266 ft.....	6	"
" from 30 in main in Mullett to w. line of Rivard s.....	10	"
" from w. line of Rivard s. to St. Aubin.....	12	"
Green ave., from Holden to Milwaukee.....	6	"
" s. from 24 inch in N. Boulevard 87 ft.....	6	"
Griffin st., e. from Mitchell 68 ft.....	4	"
Griswold st., from Detroit river to Atwater.....	3	"
" from Atwater to State.....	6	"
" s. from 12 in. main in Clifford 60 ft.....	10	"
Guiloz st., from Pallister to Whitaker.....	6	"
Gulion st., from e. line Mullett farm to Orleans.....	4	"
" from Orleans to 230 ft. e. of St. Aubin.....	3	"
" from 230 ft. e. of St. Aubin to Dubois.....	4	"
" from Chene to Joseph Campau.....	4	"
" from Joseph Campau to Walker.....	6	"
Haight ave., from 16-in. main to e. line of Woodward.....	6	"
" e. from Woodward 158 ft.....	4	"
Hale st., crossing Riopelle.....	4	"
" from Riopelle to w. line of St. Aubin.....	3 1/4	wood.
" from w. line of, to 275 ft. e. of St. Aubin.....	4	iron.
" w. from Dubois 182 ft.....	3	"
" from Dubois to Chene.....	4	"
" from Chene to Grandy.....	3	"
" from Grandy to Joe. Campau.....	3	"
Hamilton ave., from Woodward to Oakland.....	2 1/4	wood.
Hammond ave., from Toledo to s. line of L. S. R. R.....	4	iron.
" from 356 ft. s. of Leavitt to 175 ft. n. of Ranspach.....	6	"
" s. from Horatio 956 ft.....	6	"
Hancock ave., from w. line of Cass to 112 ft e. of Riopelle.....	4	"
" from St. Aubin to Dubois.....	4	"
" from 281 ft. w. of Chene to Grandy.....	4	"
" from w. line of Mitchell to McDougall.....	4	"
" crossing Collins.....	6	"
" from e. line of Collins to Detloff court.....	4	"
" from alley w. of Ellery pl. to alley w. of Mt. Elliott.....	4	"
" e. from Van Dyke 255 ft.....	4	"
" crossing Third.....	6	"

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LOCATION.		DIAM. INCHES.	KIND.
Hancock ave., n. side, e. from Third	461 ft.	4	iron
" s. side, e. from Third	10 ft.	4	"
" from Fourth to w. line of Trumbull		4	"
" from Avery to 120 ft. w. of Thirteenth		4	"
" from Wabash to Fourteenth		3	"
" crossing Fourteenth		4	"
" w. from Seventeenth	51 ft.	4	"
" e. from Twenty-third	140 ft.	4	"
" from e. line of Twenty-fourth to Twenty-fifth		4	"
" from Twenty-sixth to w. line of Vinewood		4	"
" from La Salle to Scotten		4	"
Hanover ave., crossing Russell	e. side	4	"
Harrison ave., from 16-in. main to e. line of Woodward		6	"
" from e. line of Woodward to Oakland		4	"
Harper ave., from Woodward to Russell		4	"
" from Widman pl. to 184 ft. e. of Dubois		4	"
" crossing Dubois		6	"
" from 147 ft. e. of Chene to e. line of Mitchell		4	"
" from e. line of Collins to 310 ft. e. of Moran		6	"
" crossing E. Boulevard and Collins		8	"
" w. from Twelfth	176 ft.	4	"
" w. from Fourteenth	134 ft.	4	"
Harrison ave., from Michigan to Grand River		4	"
" from Merrick to 343 ft. n. of Kirby		4	"
" from 147 ft. s. to 149 ft. n. of Piquette		6	"
" s. from Milwaukee	129 ft.	6	"
" alley w. of, from Linden s. to Linden n.		4	"
Harvey ave., from Junction to 500 ft. w. of Campbell		4	"
Hastings st., from s. line to 16 in. main in Jefferson		16	"
" from Jefferson to Champlain		24	"
" from Congress to Clinton		6	"
" from 118 ft. s. of Congress to Fort		3	"
" from Champlain to Monroe		3	"
" from Clinton to Catherine		4	"
" from Catherine to Watson		6	"
" from Watson to Canfield		10	"
" from Canfield to n. line of Warren and crossing Theodore		8	"
" from Farnsworth to Ferry		6	"
" from n. line of Medbury to Harper		8	"
" from Harper to Piquette		6	"
" from Piquette to s. line of N. Boulevard		4	"
" crossing N. Boulevard			"
" from N. Boulevard to Custer		4	"
" n. from Custer	65 ft.	6	"
" from 266 ft. s. of, to 153 ft. n. of Pallister		6	"
" alley w. of, from N. Boulevard to Custer		3 & 4	"
Hazel st., from Harrison to 159 ft. w. of Twelfth		4	"
" from 156 ft. w. of Twelfth to 96 ft. e. of Thirteenth		3	"
" e. from Thirteenth	96 ft.	4	"
Hawthorned ave., from 16 in. main to w. line of Woodward		6	"
" from w. line of Woodward to Crawford		4	"
Hack place, crossing Forest		4	"
" from Forest to Hancock		3	"
Hendelberg st., crossing Joseph Campau		4	"
" e. from Joseph Campau	270 ft.	3 1/4	wood.
" from 270 ft. to 445 ft. e. of Joseph Campau		3	iron

LOCATION.	DIAM. INCHES.	KIND.
Heidelberg st., from alley e. of McDougall to Elmwood.....	3	iron.
" crossing Elmwood w. side 39 ft.....	4	"
" from Elmwood to 70 feet of Ellery.....	6	"
Helen ave., from Jefferson to Monroe and crossing Mack.....	6	"
" from Gratiot to 133 ft. n. of Medbury.....	6	"
Hendricks st., from St. Aubin to Dubois.....	3	"
" from Dubois to alley w. of McDougall.....	4	"
" from alley e. of McDougall to Elmwood.....	4	"
" w. from Mt. Elliott 539 ft.....	4	"
Hendrie ave., from Woodward to 550 ft. e. of John R.....	4	"
" from 330 ft. west of, to e. line of Chene.....	4	"
" from 408 ft. w. of, to e. line of Grandy.....	4	"
" from Mitchell to e. line of McDougall.....	6	"
" w. from Van Dyke 219 ft.....	4	"
Henry st., from Woodward to Clifford.....	4	"
" from Cass to Third.....	6	"
" from alley e. of, to Third.....	4	"
Herbert st., from Scotten to 134 w. of Lovett.....	4	"
Hibbard ave., from Jefferson to 302 ft. n. of Brinket.....	6	"
High st., from w. line of Third to Beaubien.....	4	"
" from Beaubien to w. line of A. Beaubien farm.....	3	"
" from w. line of A. Beaubien farm to Russell.....	4	"
" from Russell to Riopelle.....	3	"
" from Grand River to Third.....	6	"
" from w. line of Third to Fourth.....	3	"
" from Fourth to alley w. of Trumbull.....	4	"
" from alley w. of Trumbull to National.....	3	"
Hoffman st., from River st. to Fort.....	8	"
Holborn ave., e. from Mt. Elliott 170 ft.....	4	"
Holbrook ave., from 16-in. main to e. line of Woodward.....	6	"
Holcomb ave., from Jefferson to Louis.....	6	"
" from Elm Grove to alley s. of Mack.....	6	"
Holten ave., from Woodward to w. line of Second.....	6	"
" from w. line of Second to Third.....	3	wood.
" from Third to Fourth.....	4	iron.
" from Fourth to Crawford.....	8	wood.
" crossing Crawford.....	6	iron.
" from Crawford to Commonwealth.....	4	"
" s. from 24-in. main in N. Boulevard 95 ft.....	10	"
Hooker ave., n. from Grand River 63 ft.....	4	"
" w. from Eighteenth 596 ft.....	4	"
Horatio st., from Howell to Welch.....	6	"
" from Welch to Livernois.....	4	"
Horton ave., from Woodward to Oakland.....	4	"
Howard st., from Tenth to Twelfth.....	4	"
" from M. C. R. R. bridge to Twenty-fourth.....	6	"
" from Twenty-fourth to Twenty-fifth.....	4	"
" e. from Scotten 354 ft.....	4	"
" w. from Junction 343 ft.....	4	"
Howell st., from alley s. of, to n. line of Buchanan.....	6	"
" n. from Horatio 680 ft.....	6	"
Hubbard ave., from Fort to 335 ft. n. of Brandon.....	6	"
" from E. st. to Michigan.....	4	"
" from Michigan to Myrtle.....	6	"
Hudson ave., crossing Fourth w. side.....	4	"
" from e. line of, to 564 ft. w. of Crawford.....	4	"
" crossing Eighteenth.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Buchanan ave., from w. line of, to 90 ft. e. of Humboldt.....	4	iron.
" from Maybury to Twenty-third.....	4	"
" e. from Twenty-fourth 119 ft.....	4	"
" from Twenty-sixth to e. line of Vinewood.....	4	"
Humboldt ave., from Michigan to s. line of D. & B. C. R. R.....	4	"
" crossing Butternut and Buchanan.....	6	"
" from 765 ft. s. of Grand River to McGraw.....	6	"
West st., from Dubois to alley w. of McDougall.....	4	"
" from alley e. of McDougall to Elmwood.....	4	"
" from 15 ft. e. of Ellery to Mt. Elliott.....	4	"
Harriet ave., crossing Jefferson to 21 ft. n. of.....	6	"
Marion st., s. from Locust 295 ft.....	3	"
" from Locust to Bagg.....	2 1/4	wood.
Illinois st., from 212 ft. w. of Beaubien to Russell.....	6	iron.
" from Russell to St. Aubin.....	4	"
" from St. Aubin to Grandy.....	2	"
" crossing Dubois and Chene.....	4	"
" from Grandy to Jos. Campau.....	2 1/4	wood.
" e. from McDougall 241 ft.....	3	iron.
" from 241 ft. e. of, to 421 ft. e. of McDougall.....	4	"
" w. from Moran 198 ft.....	4	"
Indiana st., from Beaubien to Russell.....	2	wood.
" crossing St. Antoine, Hastings, Rivard and Russell.....	4	iron.
Ingersoll st., e. from Wesson 226 ft.....	4	"
Iron st., from Wight to Jefferson.....	6	"
Irving ave., from Auburndale to 473 ft. w. of Seventh.....	4	"
Irving st., from Crawford to Seventh.....	4	"
Ivy pl., s. from Grand River 418 ft.....	6	"
Jackson st., from e. line of Scotten to Twenty-ninth.....	4	"
" from Thirty-fourth to Thirty-fifth.....	6	"
Jay st., from Riopelle to 44 ft. w. of McDougall.....	4	"
Jayne ave., n. from Mack 1,300 ft.....	6	"
Jefferson ave., from Griswold to Orleans.....	10	"
" from Second to Hastings.....	16	"
" from Dequindre to w. side of Belt line R. R.....	6	"
" from e. side of Belt line R. R. to McClellan.....	6	"
" from McClellan to e. city line.....	10	"
" e. from e. city line 741 ft.....	2	"
" from Meldrum to Pumping Works.....	62	"
" from Griswold to First.....	6	"
" alley s. of, from alley w. of Woodward to alley w. of Griswold.....	4	"
" alley s. of, from Shelby to Cass, and crossing Wayne.....	4	"
" alley s. of, from alley w. of Bates to Randolph.....	4	"
" alley s. of, from Brush to Beaubien.....	2	"
" alley s. of, e. from Beaubien 169 ft.....	4	"
" alley n. of, from alley w. of Bates to St. Antoine.....	4	"
" alley n. of, from alley e. of Griswold to First.....	4	"
" alley n. of, from First to Third.....	8	"
Jerome ave., n. from Piquette 473 ft.....	2	"
" from Milwaukee to s. line of N. Boulevard.....	4	"
" s. from 24-inch main in N. Boulevard 57 ft.....	6	"
Joe st., from Michigan to alley s. of Buchanan.....	6	"
John R st., from e. line of Woodward to Miami.....	12	"
" from Miami to Adams.....	4	"
" from Adams to Columbia.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
John R st., from Columbia to Edmund.....	8	iron.
" from Edmund to Erskine and crossing Eliot and Rowena....	6	"
" from Brady to Piquette.....	6	"
" n. from Baltimore 250 ft.....	3	"
" s. from Milwaukee 30 ft.....	6	"
" crossing n. Boulevard.....	8	"
" from alley s. of Custer to Hamlin.....	6	"
Johnson st., from alley w. of Eighteenth to Nineteenth.....	4	"
Jones st., from Cass to 160 ft. w. of Fifth.....	4	"
" s. from Sixth 240 ft.....	3	"
Joa Campan ave., from Atwater to Clinton.....	6	"
" from Jay to s. line of Gratiot.....	6	"
" from s. line of Gratiot to St. Joseph.....	4	"
" from St. Joseph to 135 ft. s. of Hancock.....	6	"
" from Theodore to Trombly.....	6	"
" from Trombly to 250 ft. n. of Milwaukee.....	4	"
" from 250 ft. n. of Milwaukee to s. line of N. Boulevard.....	6	"
" crossing N. Boulevard.....	8	"
" from n. line of N. Boulevard to 238 ft. n. of Arthur...	6	"
Josephine ave., from e. to w. line of Woodward.....	6	"
Joy st., from Cass to alley e. of Third.....	4	"
" from Fourth to Fifth.....	4	"
Julia H. st., from McClellan to Pennsylvania.....	4	"
Junction ave., from River st. to Driggs.....	6	"
" from s. line of Wabash R. R. to s line of Fort.....	6	"
" from s. line of Fort to Otis.....	8	"
Kanter ave., crossing Collins and E. Boulevard e. side 31 ft.....	6	"
" from 185 ft. w. of Collins to Moran.....	4	"
" w. from Mt. Elliott 181 ft.....	4	"
" w. from Van Dyke 208 ft.....	4	"
Kercheval ave., from Mt. Elliott to Beaufait.....	4	"
" from Field to Baldwin.....	4	"
King ave., from 16-inch main to e. line of Woodward.....	6	"
Kinsman st., from Scotten to Twenty-eighth.....	4	"
Kirby ave., from Woodward to w. line of Cass.....	4	"
" from 12 ft. e. to 180 ft. w. of Fourth.....	4	"
" e. from Crawford 430 ft.....	3	"
" from Crawford to w. line of Trumbull.....	4	"
" from Commonwealth to Avery.....	4	"
" from Harrison to 195 ft. w. of Twelfth.....	4	"
" w. from Fourteenth 128 ft.....	4	"
" from 87 ft. e. of Sixteenth to Eighteenth.....	4	"
" crossing Humboldt and w. from Twenty-seventh 247 ft.....	4	"
" crossing Brush and Woodward e. side 46 ft.....	6	"
" crossing John R and Grandy.....	4	"
" e. from Russell 216 ft.....	4	"
" from St. Aubin to Chene.....	4	"
" crossing Collins.....	6	"
" e. from Helen 238 ft.....	4	"
Koch ave., from 16-inch main to e. line of Woodward.....	6	"
" from e. line of Woodward to w. line of Oakland.....	4	"
" crossing Oakland w. side 25 ft.....	6	"
Labrosse st., from Fourth to Fifth.....	4	"
" w. from Tenth 430 ft.....	3	"
" from 430 ft. w. of Tenth to Twelfth.....	4	"
" alley s. of, from Fourth to alley e. of Twelfth.....	4	"

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LOCATION.	DIAM. INCHES.	KIND.
alley s. of, from alley e. of Fifth to Eighth.....	4	iron
alley s. of, from Eighth to Tenth.....	3	"
from Dry Dock st. 214 ft.....	4	"
from Griswold to Shelby.....	4	"
from Tenth 743 ft.....	4	"
from 743 ft. w. of Tenth to M. C. R. R. bridge.....	3	"
from Twelfth to Fourteenth.....	4	"
from w. line of Fourteenth to Fifteenth.....	3	"
from Fifteenth to alley w. of Sixteenth.....	4	"
from Seventeenth 106 ft.....	4	"
from Twenty-second to alley s. of.....	4	"
from e. line of Twenty-third to Twenty-fourth.....	4	"
e. from Scotten 256 ft.....	4	"
alley s. of, from Griswold to Shelby.....	6	"
alley s. of, from Wayne to First.....	6	"
alley s. of, from First to Fourth.....	4	"
alley s. of, from Fifth to Tenth.....	4	"
alley n. of, from Shelby to First.....	4	"
alley n. of, from First to Tenth.....	6	"
alley n. of, from Tenth 323 ft.....	4	"
alley n. of, e. from Fourteenth 190 ft.....	3	"
LaSalle pl., e. from Scotten 364 ft.....	4	"
LaSalle st., from River st. to Fort.....	4	"
from Fort to s. side M. C. R. R.....	6	"
LaSalle pl., e. from Twenty-second 240 ft.....	3 1/4	wood.
crossing Twenty-second and Twenty-third, east side, 26 ft.....	4	iron
LaSalle ave., from Fourth to 563 ft. w. of Crawford.....	4	"
LaSalle st., crossing Vinewood, e. side.....	4	"
LaSalle ave., from Fort to 159 ft. n. of Christlancy.....	6	"
from 337 ft. s. of Dix to Toledo.....	6	"
LaSalle st., from Third to Hastings.....	16	"
from Bates to Brush.....	4	"
from St. Antoine to Dequindre.....	4	"
from Riopelle to St. Aubin.....	12	"
from St. Aubin to w. line of Elmwood.....	4	"
from w. line of Elmwood to 743 ft. e. of.....	6	"
crossing Lieb, e. side, and Mt. Elliott, w. side.....	4	"
from Lieb to Mt. Elliott.....	3 1/4	wood.
w. from Helen 156 ft.....	4	iron
from Woodward to alley w. of.....	8	"
from Third to Fourth.....	8	"
from Fourth to Fifth.....	4	"
LaSalle ave., n. from Michigan 505 ft.....	6	"
from n. line of G. T. R. R. to n. line of Buchanan.....	6	"
from 359 ft. s. to 398 ft. n. of Hancock.....	6	"
s. from McGraw 395 ft.....	6	"
Lauderdale ave., w. from Junction 273 ft.....	4	"
Laurel st., from Grand River to Wabash.....	4	"
Leavitt ave., from Wesson to Livernois.....	4	"
Leavitt st., from Cass to Third.....	6	"
Leib st., from Wight to Jefferson.....	6	"
from Jefferson to Champlain.....	4	"
from Champlain to Monroe.....	3	"
Leicester court, from 16 in. main to e. line of Woodward.....	6	"
e. from Woodward 1,379 ft.....	4	"
Leland st., w. from Beaubien 306 ft.....	3	"

LOCATION.	DIAM. INCHES.	KIND.
Leland st., from Beaubien to 21 ft. e. of Dequindre.....	4	iron.
" from 21 ft. e. of Dequindre to McDougall.....	8	"
" from McDougall to Collins.....	3	"
" from 216 ft. w. of Moran to Gratiot.....	4	"
Leroy place, n. from Forest 251 ft.....	3	"
Leasing st., e. from McClellan 158 ft.....	4	"
Leverette st., from Seventh to Eighth and Tenth to Twelfth.....	4	"
" alley s. of, from Eighth to Tenth....	4	"
Lewis st., from Cass to Fourth.....	4	"
Lincoln ave., from Grand River to alley n. of.....	4	"
" crossing Brigham n. side 36 ft.....	8	"
" from n. line of Brigham to 510 ft. n. of Holden.....	6	"
" s. from 24 in. main in N. Boulevard 64 ft.....	6	"
" alley w. of, from alley n. of Grand River to s. line of Brig- ham.....	4	"
" alley west of, crossing Brigham s. side 16 ft.....	6	"
Linden st., from Harrison to Eighteenth and crossing Humboldt.....	4	"
" from alley w. of Humboldt to Maybury.....	4	"
" from Tillman to Twenty-fourth.....	4	"
" from Twenty-fifth to 26 ft. e. of Twenty-sixth.....	4	"
Liverdoo ave., from Dix to M. C. R. R.....	8	"
" from M. C. R. R. to n. line of city limits.....	10	"
Locust st., from Grand River to Fourth.....	6	"
" from Fourth to alley e. of Trumbull.....	4	"
" from alley w. of Trumbull to 30 ft. e. of National.....	3	"
" e. from National 30 ft.....	4	"
" from Harrison to Wabash.....	4	"
Lorman st., from Crane to Company.....	4	"
Louis ave., from Crane to Holcomb.....	4	"
Lowett ave., from Michigan to n. line of Buchanan.....	6	"
" n. from Rich 912 ft.....	4	"
" from 912 ft. n. of Rich to 264 ft. n. of Herbert.....	6	"
Ludden st., from Gratiot to Mt. Elliott.....	4	"
Lutheran cemetery, in the grounds and w. from Mt. Elliott 650 ft.....	3	"
Lyman st., from Crystal to Orleans.....	4	"
Lyander st., from Fourth to Crawford.....	3	"
" crossing Sixth w. side.....	4	"
" from Sixth to Seventh.....	3	"
" from Seventh to Lincoln.....	4	"
" from Avery to e. line of Thirteenth.....	4	"
McArthur st., w. from Twenty-seventh 340 ft.....	4	"
McClellan ave., from Jefferson to Marietta.....	6	"
" from Marietta to Mack.....	8	"
" from s. line of Mack to 144 ft. n. of Julia H.....	10	"
" n. from Gratiot 299 ft.....	8	"
McDougall ave., from Atwater to Clinton.....	6	"
" from Preston to Gratiot.....	8	"
" from Gratiot to Canfield.....	4	"
" from Canfield to 187 ft. n. of Garfield.....	6	"
" from 187 ft. n. of Garfield to 301 ft. n. of.....	8	"
" crossing Waterloo and Cleveland.....	8	"
" s. from Hancock 76 ft.....	6	"
" s. from Farnsworth 170 ft.....	6	"
" from n. line of Hendrie to Palmer.....	6	"
" alley w. of, from Mullett to Jay.....	4	"
" alley w. of, from Cleveland to Hendricks.....	3	"

LOCATION.	DIAM. INCHES.	KIND.
McDougall ave., alley w. of, from Hendricks to Hunt.....	4	iron
" alley w. of, from Hunt to Charlevoix.....	3	"
" alley w. of, from Charlevoix to Arndt.....	3	wood
" alley w. of, from Arndt to Berlin.....	4	iron
" alley w. of, from Berlin to Heidelberg.....	3 1/2	wood
" alley e. of, from Mullett to 88 ft. n. of Chestnut.....	4	iron
" alley e. of, from Waterloo to Preston.....	3	"
" alley e. of, crossing Cleveland.....	4	"
McGraw ave., from Sixteenth to Sullivan.....	4	"
" e. from Winslow 76 ft.....	4	"
" from Grand River to Twenty-sixth.....	4	"
" from LaSalle to Scotten.....	4	"
McKinstry ave., from River st. to n. line of Toledo.....	6	"
McMillan st., w. from Junction 319 ft.....	4	"
" crossing Liversols e. side.....	4	"
Mack ave., from Gratiot to Cadillac.....	4 1/2	"
" from Gratiot to Townsend.....	4	"
" from Townsend to Baldwin and crossing Mt. Elliott.....	6	"
" w. from Helen 80 ft.....	6	"
" from Thorburn to 267 ft. e. of Parker.....	8	"
" from 689 ft. w. of, to 577 ft. w. of Jayne.....	8	"
" from 307 ft. w. of Jayne to 65 ft. e. of Crane s.....	8	"
" from McClellan to Pennsylvania.....	8	"
Macomb st., from St. Antoine to Elmwood.....	4	"
" alley s. of, from Brush to alley w. of.....	3	"
" alley s. of, from Brush to St. Antoine.....	4	"
" alley n. of, from Brush to alley w. of.....	3	"
" alley n. of, from Brush to St. Antoine.....	4	"
Madison ave., n. and s. sides from Witherell to John R.....	4	"
" from Randolph to St. Antoine.....	4	"
" alleys n. and s. of, from John R to Randolph.....	4	"
Magnolia st., from Harrison to Thirteenth.....	4	"
" from Thirteenth to Wabash.....	3	"
" from Fourteenth to Fifteenth.....	4	"
" from Eighteenth to Sullivan.....	3	"
" from Sullivan to Maybury.....	4	"
" crossing Humboldt and Twenty-fourth.....	4	"
" from Twenty-seventh to Vinewood.....	4	"
Mansur st., from Harper to 78 ft. s. of Piquette.....	4	"
Maple st., from Gratiot to Orleans.....	8	"
" from Orleans to St. Aubin.....	4	"
" crossing Dubois.....	8	"
" from St. Aubin to Elmwood.....	6	"
Marcy st., w. from Fourth 156 ft.....	3	"
" from 156 ft. w. of Fourth to Crawford.....	4	"
Marrietta st., e. from McClellan 521 ft.....	4	"
Mark st., w. from Twelfth 180 ft.....	4	"
Marston court from 16-inch main to e. line of Woodward.....	6	"
Martin pl. from Woodward to John R.....	4	"
Maybury ave., from Michigan to n. line of Ash.....	6	"
" from n. line of Ash to 34 ft. n. of G. T. Ry.....	8	"
" from 307 ft. s. of, to 178 ft. n. of Warren.....	8	"
" s. from Hudson 256 ft.....	8	"
Mechanic st., from Brush to Beaubien.....	4	"
Medbury ave., from Woodward to 250 ft. e. of John R.....	4	"
" w. from St. Aubin 730 ft.....	3	"

LOCATION.	DIAM. INCHES.	KIND.
Medbury ave., from w. line of St. Aubin to Jos. Campau.....	4	iron.
" crossing E. Boulevard and Collins.....	6	"
" w. from Collins 165 ft.	4	"
" from Helen to Frontenac.....	4	"
Meldrum ave., from Jefferson to Congress.....	42	"
" from Wight to 46 ft. n. of Fort.....	6	"
" from 46 ft. n. of Fort to 360 ft. n. of Kercheval.....	4	"
" from 360 ft. n. of, to 570 ft. n. of Kercheval.....	6	"
" from Arndt to Gratiot and crossing N. Boulevard.....	6	"
Merrick ave., from Cass to Third.....	4	"
" w. from Fourth 136 ft.	4	"
" from 136 ft. w. of Fourth to e. line of Crawford.....	3	"
" from e. line of Crawford to Lincoln.....	4	"
" from Trumbull to Twelfth.....	4	"
" w. from Twelfth 214 ft.	3	"
" from 214 ft. w. of Twelfth to Wabash.....	3	wood.
" w. from Seventeenth 132 ft.	4	iron.
" from Tillman to Twenty-third.....	4	"
" from Twenty-seventh to Vinewood.....	4	"
Miami ave., from Gratiot to Witherell.....	16	"
" n. side from John R to Witherell ...	4	"
" alley w. of, from Gratiot to alley s. of.....	6	"
" alley w. of, from Gratiot to Witherell.....	4	"
" alley e. of, from Randolph to John R.....	4	"
Michigan ave., from Woodward to Cass.....	24	"
" from Washington to First.....	10	"
" from First to Twenty-fourth.....	8	"
" from Twenty-fourth to Livernois.....	6	"
" s. side crossing W. Boulevard.....	6	"
" alley s. of, from Shelby to Cass.....	4	"
" private alley s. of, e. from Shelby 110 ft.	3	"
" alley n. of, from alley e. of Griswold to alley e. of Wash- ington.....	4	"
" alley n. of, from alley w. of Washington to alley w. of Cass	4	"
" alley n. of, from First to alley e. of Second.....	4	"
Military ave., from River st. to 260 ft. n. of Wabash R. R.	6	"
" from 62 ft. n. of Anthon to 157 ft. n. of McMillan.	6	"
Miler st., from Sixth to Seventh.....	3	"
" crossing Seventh.....	4	"
Milwaukee ave., from Beaubien to Green.....	6	"
" from w. line of Avery to Twelfth.....	6	"
" from e. line of Eighteenth to 36 ft. w. of Sullivan.....	4	"
" from Beaubien to w. line of Riopelle.....	4	"
" from Dubois to Chene.....	4	"
" crossing Collins.....	8	"
Miner st., e. from Crane 336 ft.	4	"
Minnie ave., from River st. to 582 ft. s. of Fort.....	6	"
" from 582 ft. s. of, to Fort.....	4	"
Mitchell ave., n. from Gratiot 265 ft.	6	"
" from 265 ft. n. of Gratiot to Canfield.....	4	"
" from Canfield to Harper.....	6	"
" n. from Harper 324 ft.	4	"
" from 324 ft. n. of Harper to 150 ft. s. of Trombly.....	6	"
" from 150 ft. s. of Trombly to Griffin.....	4	"
Moeller st., e. from Russell 330 ft.	4	"
Mohawk st., crossing Vinewood.....	4	"

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LOCATION.	DIAM. INCHES.	KIND.
from a. from Cadillac square 51 ft.....	6	iron.
from 51 ft. s. of Cadillac square to Farmer.....	4	"
from St. Antoine to Elmwood.....	4	"
from 224 ft. w. of, to 171 ft. e. of Lieb.....	4	"
w from Helen 185 ft.....	4	"
from Crane to alley w. of.....	4	"
alley s. of, from alley n. of Cadillac square to Randolph.....	4	"
alley s. of, from alley e. of Woodward to Farmer.....	4	"
alley n. of, from Farmer to alley e. of Farrar.....	6	"
from w. from Woodward 412 ft.....	4	"
from 412 ft. w. of Woodward to Cass.....	3	"
from alley e. of Woodward to Brush.....	4	"
from Brush to St. Antoine.....	3	"
from St. Antoine to Hastings.....	6	"
from Hastings to Russell.....	3	"
alley s. of, w. from Beaubien 240 ft.....	2 1/2	wood.
crossing Vinewood, e. side.....	4	iron.
w. from Twenty-seventh 186 ft.....	4	"
from Gratiot to Dane.....	6	"
from River st. to s. line of Christiancy.....	6	"
from 345 ft. s. of Dix to Toledo.....	6	"
s. from Gratiot 305 ft.....	6	"
from 16-in. main to e. line of Woodward.....	6	"
e. from Woodward 558 ft.....	4	"
from 148 ft. s. of Wight to 285 ft. s. of Kercheval.....	6	"
from 285 ft. s. of Kercheval to Preston.....	8	"
from Preston to Mack.....	10	"
from Mack to Gratiot and crossing N. Boulevard.....	8	"
from Gratiot to 300 ft. n. of Griffin.....	4	"
from Gratiot to Chene.....	20	"
from St. Antoine to Elmwood.....	4	"
w. from Crane 211 ft.....	4	"
from Twelfth to Thirteenth.....	4	"
from Grand River to Hubbard.....	6	"
crossing Vinewood.....	6	"
from Brush to Russell.....	4	"
from Michigan to Grand River.....	6	"
from Nineteenth to Twentieth.....	6	"
e. from Foundry in Griffin's foundry yard.....	2	"
w. from Junction 241 ft.....	4	"
w. from Chene 1,264 ft.....	4	"
from Fort to Baker.....	4	"
from Baker to Newark.....	6	"
w. from Fourth 180 ft.....	2	"
from 180 ft. w. of Fourth to Crawford.....	4	"
from Sixth to Seventh.....	4	"
e. from Junction 265 ft.....	4	"
e. from Wesson 283 ft.....	4	"
from 24 in. main to s. line of N. Boulevard.....	10	"
from Horton to Hamlin.....	6	"
from Marston to Koch and crossing Harmon.....	10	"
from First to e. side of Elton park.....	4	"
from w. side of Elton park to Sixth.....	4	"
from Sixth to Trumbull.....	6	"
from Atwater to Jefferson.....	10	"
from Jefferson to reservoir grounds.....	8	"

LOCATION.	DIAM. INCHES.	KIND.
Orleans st., from Congress to reservoir grounds.....	24	iron.
" from reservoir to Scott.....	30	"
" s. from Canfield 30 ft.....	30	"
" crossing Leland s. side and from Alexandrine to Canfield...	6	"
" n. from Garfield 252 ft.....	4	"
" from 252 ft. n. of Garfield to 195 ft. n. of Forest.....	6	"
" from Trombly to Lyman.....	4	"
Ottawa st., e. from Thirteenth 130 ft.....	3	"
Otis st., e from Junction 303 ft.....	4	"
Owen ave., from 16 in. main to 1,220 ft. e. of Woodward.....	6	"
Palister ave., crossing Woodward.....	4	"
" from Woodward to Oakland.....	3	wood.
" from Oakland to 393 ft. e. of St. Aubin.....	6	iron.
" north side, connecting 8-in. to 16-in. main in Woodward...	8	"
Palmer ave., from Woodward to w. line of Brush farm.....	4	"
" crossing Brush and Collins.....	6	"
" from 126 ft. w. of Dubois to e. line of Grandy.....	4	"
" crossing Russell and St. Aubin.....	4	"
" e. from Moran 190 ft.....	4	"
" from Mt. Elliott to 159 ft. e. of Meldrum.....	6	"
" w. from Van Dyke 231 ft.....	4	"
Park ave. from Dix to Toledo.....	6	"
Park pl., from Michigan to s. line of State.....	4	"
Park st., from e. line of Woodward to Washington.....	16	"
" from Woodward to alley s. of Columbia.....	6	"
" from Henry to Peterboro.....	4	"
Parker ave., n. from Mack 312 ft.....	6	"
Parsons st., from Woodward to Cass.....	4	"
Pennsylvania ave., n. from Jefferson 1076 ft.....	6	"
" from Mack to Julia H.....	6	"
Perry st., from Grand River to alley e. of Trumbull.....	4	"
" from alley w. of Trumbull to National.....	4	"
" alley s. of, from alley e. of Seventh to alley e. of Trumbull...	4	"
" from Humboldt to Eighteenth.....	4	"
Peterboro st., from Woodward to Cass.....	4	"
Pierce st., from Dequindre to Jos Campau.....	4	"
Pine st., from Grand River to National.....	4	"
" from National to Twelfth.....	3	"
" crossing Twelfth, e. side.....	4	"
Pitcher st., from Cass to alley e. of Third.....	4	"
" w. from Fourth 150 ft.....	3	"
" from 150 ft. w. of Fourth to Crawford.....	4	"
" from Sixth to Seventh.....	4	"
Pingree ave., from Woodward to Crawford.....	6	"
Piquette ave., from Woodward to Beaubien.....	4	"
" from Beaubien to Hastings.....	3	"
" from Hastings to Russell and crossing St. Aubin.....	4	"
" from 466 ft. w. of, to e. line of Chene.....	4	"
" e. from Florence 98 ft.....	4	"
" crossing E. Boulevard and Collins.....	6	"
" from E. Boulevard to Collins.....	4	"
" e. from Moran 85 ft.....	4	"
" w. from Mt. Elliott 396 ft.....	4	"
" from Concord to Canton.....	4	"
" crossing Crawford, e. side.....	4	"
" from w. line of Avery to e. line of Twelfth.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Piquette ave., crossing Twelfth, e. side.....	6	iron.
" from Wabash to Fourteenth.....	4	"
" from Eighteenth to Sullivan.....	4	"
Pleasant ave., n. from River st. 515 ft.	4	"
Plum st., from Second to alley e. of Trumbull.....	4	"
" from alley e. of, to Trumbull.....	6	"
Plumer st., from w. line of McKinstry to 283 ft. w. of Junction.....	4	"
" from Welch to Livernois.....	4	"
Poplar st., from 110 ft. e. of Wabash to w. line of Fifteenth.....	4	"
" crossing Thirteenth w. side.....	4	"
" e. from Maybury 376 ft.....	4	"
" from Tillman to 184 ft. w. from Twenty-third.....	4	"
" e. from Welch 289 ft.....	4	"
Porter st., w. from Twelfth 210 ft.....	3	"
" e. from Twelfth 200 ft.....	4	"
" from 210 ft. w. of Twelfth to Thirteenth.....	4	"
" crossing Fourteenth.....	4	"
" e. from Fourteenth 173 ft.....	3	"
" from Eighteenth to Nineteenth.....	4	"
" from Twentieth to Twenty-first.....	3	"
" w. from Twenty-first 150 ft.....	4	"
" from 150 ft. w. of Twenty-first to Twenty-second.....	3	"
" from Twenty-second to e. line of W. Boulevard.....	4	"
" from e. line of W. Boulevard to Vinewood.....	6	"
" from Hubbard to Scotten.....	3	"
" from McKinstry to Ferdinand.....	4	"
" alley s. of, from Thirteenth to alley e. of.....	3	"
Prentiss ave., from Cass to Third.....	4	"
Preston st., from McDougall to Mt. Elliott.....	4	"
Private st., (n. of Ferry) crossing Rivard.....	4	"
" w. from Rivard 362 ft.....	3	"
Private way (e. of Russell) s. from Pallister 405 ft.....	4	"
Pulford ave., from Gratiot to Mt. Elliott.....	4	"
" from Meldrum to Beaufait.....	4	"
Putnam ave., w. from Woodward 60 ft.....	6	"
" from 60 ft. w. of Woodward to w. line of Cass.....	4	"
" n. side, e. from Third 323 ft.....	4	"
" from Fourth to Lincoln.....	4	"
" from Trumbull to Twelfth.....	4	"
" w. from Twelfth 185 ft.....	3	"
" from Wabash to Fourteenth.....	4	"
Randall st., crossing Twenty-third w. side 26 ft.....	4	"
Randolph st. from alley s. of Atwater to Jefferson.....	4	"
" from Atwater to 24-in. main in Cadillac square.....	8	"
" from Larned to Congress.....	4	"
" from Congress to Adams.....	6	"
" crossing Gratiot.....	10	"
" alley w. of, n. from Atwater.....	3	"
" alley e. of, from alley s. of Fort to Champlain.....	4	"
" alley e. of, from alley n. of Monroe to Gratiot.....	4	"
Ranspach st., from Hammond to Livernois.....	4	"
Raynor st., from Tinton to Gratiot.....	4	"
Reed pl., w. from Fourth 36 ft.....	4	"
" from 36 ft. w. of Fourth to Crawford.....	3	"
" w. from Crawford 335 ft.....	4	"
Reeder ave., from Junction to 434 ft. w. of Campbell.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Reservoir grounds, n. of basin to 30-in. branch.....	24	Iron.
" s. and w. sides of basin.....	24	"
Rich st., e. from Vinewood 304 ft.....	4	"
" from Scotten to Twenty-eighth.....	4	"
Riopelle st., from Atwater to Jefferson.....	8	"
" from Jefferson to Larned.....	12	"
" from Larned to Adelaide.....	8	"
" from Adelaide to 218 ft. n. of Hancock.....	6	"
" from Frederick to Kirby.....	6	"
" alley e. of, s. from Canfield 218 ft.....	4	"
Rivard st., from Atwater to Jefferson.....	8	"
" from Larned to Congress.....	4	"
" from Jefferson to Clinton.....	10	"
" from Mullett to Gratiot.....	10	"
" from Gratiot to Watson.....	4	"
" from Eliot to 90 ft. s. of Warren.....	4	"
" from 90 ft. s. of Warren to 10 ft. n. of Farnsworth.....	6	"
" from 10 ft. n. of Farnsworth to 221 ft. n. of Palmer.....	4	"
" from 221 ft. n. of, to 261 ft. n. of Palmer.....	6	"
" crossing Medbury 126 ft.....	6	"
" crossing Piquette.....	4	"
" from 5 ft. s. of, to 153 ft. n. of N. Boulevard.....	6	"
" from 153 ft. n. of N. Boulevard to Pallister.....	4	"
" n. from Pallister 1,178 ft.....	6	"
River st., from Third to Fourth.....	4	"
" from Fifth to Sixth.....	4	"
" from Sixth to e. side of M. C. R. R.....	8	"
" crossing M. C. R. R. tracks 270 ft.....	6	"
" from w. side M. C. R. R. to 525 ft. w. of Twenty-fourth.....	8	"
" from Pleasant to Campau.....	8	"
" from Campau to main entrance of Exposition Grounds.....	6	"
" s. from main into Det. & L. S. Copper Wks.....	4	"
Roby st., n. from Ferry 325 ft.....	4	"
Rohns ave., from Elm Grove to alley s. of Mack.....	6	"
Romeyn st., from Junction to Campbell.....	4	"
Rose st., from Eighteenth to Twentieth.....	4	"
Rosedale ave., from 16 in. main to e. line of Woodward.....	6	"
" from e. line of Woodward to w. line of Oakland.....	4	"
Rowena st., from Woodward to Riopelle.....	4	"
Rowland st., s. from State 187 ft.....	4	"
" n. from State 237 ft.....	6	"
Russell st., from Larned to Congress n. line.....	6	"
" from Congress to Monroe.....	8	"
" from Mullett to Watson.....	8	"
" from Watson to Canfield.....	6	"
" from Canfield to s. line of Hendrie.....	10	"
" from s. line of Hendrie to s. line of Piquette.....	8	"
" from s. line of Piquette to Moeller.....	6	"
" alley e. of, from Chase to Fort.....	4	"
" alley e. of, n. from Willis 220 ft.....	4	"
Sargent st., crossing Collins.....	6	"
Savoy st., from Twenty-first to Twenty-second.....	4	"
" from Twenty-third to Twenty-fourth.....	4	"
Schiller st., e. from McClellan 245 ft.....	4	"
Schneider place, w. from Mt. Elliott 255 ft.....	4	"
Scott st., from Orleans to Chene.....	30	"

LOCATION.	DIAM. INCHES.	KIND.
Scott st., from Riopelle to e. line of St. Aubin.....	4	iron.
" from e. line of St. Aubin to Dubois.....	3	"
" crossing Dubois to 156 ft. e.....	4	"
" from 156 ft. e. of, Dubois to 499 ft. e. of Chene.....	3	"
" from 499 ft. e. of Chene to Joseph Campau.....	4	"
Scotten ave., from Fort to Dix.....	6	"
" from Dix to Buchanan.....	8	"
" from Buchanan to McGraw.....	6	"
" e. side from Buchanan s. to Buchanan n. 100 ft.....	16	"
Sears ave., from Holcomb to 100 ft. e. of McClellan.....	4	"
Second st., from Front to alley n. of Jefferson.....	6	"
" from Jefferson to alley n. of, and crossing Congress.....	10	"
" from Abbott to alley s. of.....	8	"
Second st. and ave., from Abbott to Baggs.....	10	"
Second ave., from High to 166 ft. n. of Henry.....	4	"
" from Baggs to 30 ft. n. of Prentiss.....	6	"
" crossing Canfield.....	8	"
" e. side, from s. line of Forest to 184 ft. n. of.....	6	"
" e. side, crossing Hancock, Warren and Putnam.....	6	"
" e. side, crossing Merrick, Kirby and Holden.....	6	"
" w. side, crossing Hancock, Warren and Putnam.....	4	"
" w. side, crossing Merrick, Kirby and Holden.....	4	"
" w. side, s. from Holden 700 ft.....	3	wood.
" from Holden to 205 ft. n. of Milwaukee.....	6	iron.
" crossing N. Boulevard.....	8	"
Second st., alley e. of, from alley n. of Michigan to Spencer.....	4	"
Second ave., alley e. of, from alley n. of Canfield to Prentiss.....	4	"
Selden ave., from Woodward to Third.....	4	"
" from Fourth to alley w. of.....	4	"
" from alley w. of Fourth to Crawford.....	3	"
" from Sixth to Seventh.....	4	"
Seventh st., from River st. to alley n. of Lafayette.....	8	"
" from alley n. of Lafayette to Baggs.....	10	"
" from Baggs to Grand River.....	8	"
" from Grand River to Brigham.....	6	"
" crossing Brigham.....	8	"
" from Brigham to n. line of Putnam and crossing Merrick.....	6	"
" from 214 ft. s. of Kirby to 330 ft. n. of Stanley.....	6	"
" alley w. of, from alley n. of Pine to Spruce.....	3	"
" alley w. of, from Perry to alley s. of.....	4	"
Seventeenth st., from Fort to 28 ft. s. of Poplar.....	6	"
" from 28 ft. s. of Poplar to s. line of Buchanan.....	4	"
" from s. line of Buchanan to 244 ft. n. of Hancock.....	6	"
" from Merrick to s. line of Stanley.....	6	"
" from s. to n. line of N. Boulevard.....	6	"
Shady Lane, crossing W. Boulevard.....	4	"
" crossing Vinewood.....	6	"
Shelby st., w. side from Atwater to Woodbridge.....	3	"
" w. side from Woodbridge to Jefferson.....	4	"
" e. side from Woodbridge to Jefferson.....	8	"
" from Jefferson to Michigan.....	10	"
" from Lafayette to alley s. of Michigan.....	4	"
Sheridan ave., from Jefferson to Kercheval.....	6	"
" from Mack to Gratiot.....	6	"
" from Gratiot to 18 ft. n. of Kirby.....	8	"
Sherman st., from Hastings to Elmwood.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Sherman st., from Crane to alley w. of.....	4	iron.
“ n. side from Russell to Orleans.....	8	“
Sibley st., from Woodward to Clifford.....	4	“
Sidney ave., from 16-inch main in Woodward to w. line of Oakland.....	6	“
Sixth st., from River st. to Congress.....	16	“
“ from Congress to Abbott.....	24	“
“ from River st. to alley n. of.....	4	“
“ from alley n. of Labrosse to Bagg.....	4	“
“ n. from Bagg 88 ft.....	8	“
“ from 88 ft. n. of Bagg to 473 ft. n. of Grand River.....	4	“
“ from 473 ft. n. of Grand River to Brigham.....	6	“
“ crossing Brigham.....	8	“
“ from Brigham to 285 ft. n. of Lysander.....	4	“
Sixteenth st., from Lafayette to Myrtle.....	6	“
“ from Myrtle to Buchanan.....	8	“
“ from Buchanan to Grand River.....	10	“
“ from Grand River to McGraw.....	6	“
“ s. from 24-inch main in N. Boulevard 68 ft.....	8	“
“ alley w. of, from Lafayette to Howard.....	3	“
Smith ave., from Woodward to Oakland.....	4	“
South st., from Grand River to Noble.....	4	“
Southern ave., e. from Livernols 152 ft.....	4	“
Spencer st., from Cass to Second.....	4	“
Sproat st., from Woodward to Cass.....	4	“
Spruce st., from Fifth to alley w. of Seventh.....	4	“
“ from alley w. of Trumbull to National.....	4	“
“ from Harrison to Twelfth.....	4	“
“ alley s. of, from alley w. of Seventh to alley e. of Trumbull.....	3	“
St. Albertus pl., from 22 ft. e. of Dequindre to 260 ft. w. of St. Aubin.....	4	“
“ w. from St. Aubin 260 ft.....	3	“
St. Antoine st., from Atwater to Congress.....	8	“
“ from Jefferson to Congress.....	4	“
“ from Congress to n. line of Gratiot.....	6	“
“ crossing Champlain.....	8	“
“ from Gratiot to Elizabeth.....	4	“
“ from Elizabeth to Adelaide.....	6	“
“ from Adelaide to Watson.....	8	“
“ from Watson to Farnsworth and crossing Frederick.....	6	“
“ n. from Piquette 445 ft.....	6	“
“ from 150 ft. s. of Milwaukee to 4-in. in N. Boulevard.....	6	“
“ crossing N. Boulevard.....	8	“
St. Aubin ave., from Atwater to n. line of Trombly.....	6	“
“ from Pallister to 75 ft. n. of Vulcan.....	6	“
“ from Congress to Champlain.....	36	“
“ from Larned to Congress.....	12	“
“ crossing N. Boulevard.....	10	“
“ alley w. of, s. from Ferry 266 ft.....	2 1/4	wood.
St. Clair pl., from Nineteenth to alley w. of Eighteenth.....	4	iron.
St. Joseph st., from Russell to Riopelle.....	3	“
“ from e. line of Riopelle to 310 ft. e. of St. Aubin.....	4	“
“ from 310 ft. e. of St. Aubin to 202 ft. e. of Chene.....	3	“
“ from 202 ft. e. of Chene to Grandy.....	4	“
“ from Grandy to Jos. Campau.....	2 1/4	wood.
“ from w. line of McDougall to 438 ft. e. of.....	3 & 4	iron.
St. Paul ave., from Bellevue to e. line of Concord.....	4	“
“ crossing E. Boulevard.....	6	“

LOCATION.	DIAM. INCHES.	KIND.
First ave., from e. line of E. Boulevard to e. line of Field	4	iron.
from Townsend to Baldwin	4	"
from Crane to alley w. of	4	"
Humboldt st., from Twentieth to Foundry	6	"
Hawley ave., from Seventh to Commonwealth	4	"
crossing Crawford, Eighteenth and Humboldt	4	"
w. from Twelfth 183 ft.	4	"
Clark ave., from Welch to Liversols	4	"
State st., from Woodward to Washington	30	"
from Woodward to Washington	10	"
w. of branch in Washington 94 ft.	24	"
Samson pl., from Woodward to Cass	4	"
Sullivan ave., from Michigan to 270 ft. n. of Linden	6	"
s. from Buchanan 288 ft.	6	"
from 33 ft. n. of Stanley to 61 ft. n. of McGraw	6	"
from 164 ft. s. of Piquette to Baltimore	6	"
from s. to n. line of N. Boulevard	8	"
Summit ave., from River st. to Wabash R. R.	6	"
Superior st., w. from Beaubien 330 ft. and crossing Brush	4	"
from Beaubien to Hastings	2 1/2	wood.
crossing St. Antoine, Hastings and Russell	4	iron.
s. from Hastings 359 ft.	3	wood.
w. from Rivard 487 ft.	4	iron.
from Rivard to Russell	2 1/2	wood
from Riopelle to Dequindre	4	iron
from Dequindre to St. Aubin	2 1/2	wood.
crossing Riopelle, St. Aubin and Chene	4	iron
from St. Aubin to 343 ft. e. of Chene	3	"
from 343 ft. e. of Chene to Mitchell	4	"
McDougall to Gratiot	4	"
Swain ave., from 40 ft. s. of Wabash R. R. to Fort	6	"
Sycamore st., w. from Grand River 133 ft.	6	"
from alley w. of Trumbull to National	4	"
from Harrison to Wabash	4	"
Sylvester st., from Gratiot to Mt. Elliott	4	"
from Beaufait to Concord	4	"
Tenth st., from River st. to Baker	8	"
from Baker to Michigan	6	"
Theodore st., e. from John R., 408 ft. and crossing Brush	4	"
from 236 ft. w. of Beaubien to 106 ft. e. of Riopelle	4	"
from 268 ft. w. of St. Aubin to Grandy	4	"
crossing Collins	6	"
e. from Moran 373 ft	4	"
from Mt. Elliott to w. line of Beaufait	4	"
Third st., from Front to s. line of River st	6	"
from s. line of River st., to Larned	8	"
from Larned to alley n. of	6	"
from Larned to Fort	24	"
from Abbott to High	6	"
Third ave., from Grand River to Bagge and crossing Brigham	4	"
from Bagge to Holden	6	"
from Brigham to Canfield	30	"
alley e. of, from Henry to Brainard	4	"
Thirteenth st., from Porter to 112 ft. n. of Elm and crossing Myrtle	6	"
from Magnolia to n. line of Grand River	6	"
n. from Grand River 490 ft	4	"

BOARD OF WATER COMMISSIONERS.

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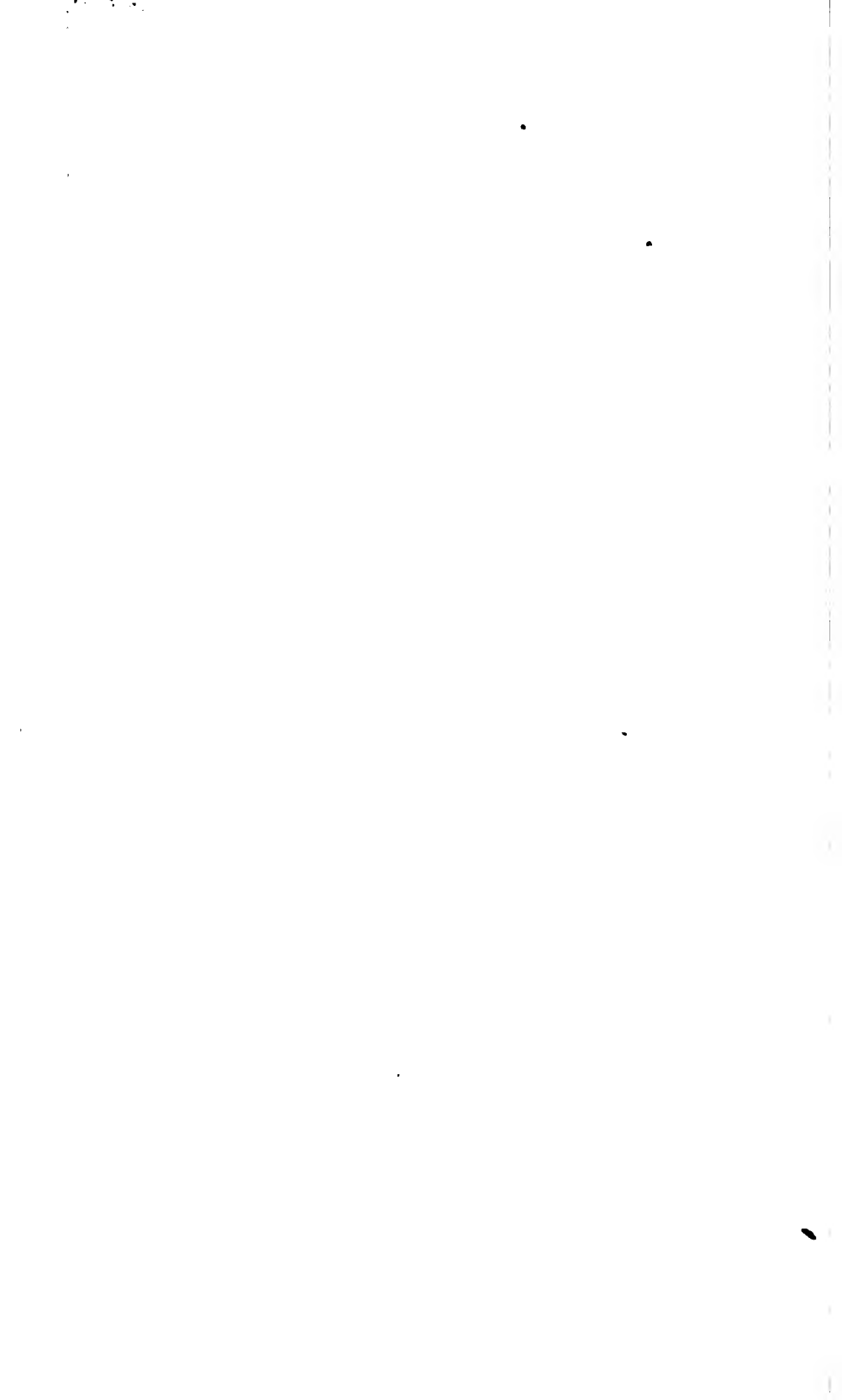
LOCATION.	DIAM. INCHES.	KIND.
Thirteenth st., s. from Hancock 80 ft.....	6	iron.
" n. from Hancock 180 ft.....	4	"
" from 150 n. of Hancock to 59 ft. n. of Warren.....	6	"
" alley e. of, s. from Porter 131 ft.....	4	"
Thirtieth st., from 30 ft. s. of Jackson to Buchanan.....	6	"
Thirty-first st., from Michigan to 250 ft. s. of Warren.....	6	"
Thirty-second st., from Michigan to 85 ft. n. of Buchanan.....	6	"
" from 85 ft. n. of, to 263 ft. n. of Buchanan.....	8	"
Thirty-third st., from Michigan to 462 ft. n. of Buchanan.....	6	"
Thirty-fourth st., from 60 ft. s. of, to 136 ft. n. of Jackson.....	8	"
" from 64 ft. s. of, to n. of Buchanan.....	8	"
Thirty-fifth st., from Michigan to 192 ft. n. of Jackson and crossing Buchanan.....	6	"
" from n. line of Buchanan to 223 ft. n. of Rich.....	8	"
Thorburn ave., s. from Mack 1,628 ft.....	6	"
Tillman ave., from Michigan to Breckenridge.....	6	"
" s. from Warren 198 ft.....	6	"
" from 360 ft. s. of, to 300 ft. n. of Merrick (on the w.).....	6	"
" from Hudson to McGraw.....	6	"
Toledo ave., from 360 ft. e. of Scotten to McKinstry.....	4	"
" from McKinstry to Livernols.....	6	"
Torrey st., crossing Scotten (w. side).....	4	"
" from Lovett to Twenty-eighth.....	4	"
Townsend ave., from Jefferson to Kercheval.....	6	"
" n. from Mack 208 ft.....	6	"
" from 208 ft. n. of Mack to s. line of Gratiot.....	4	"
" from s. line to 8-inch main in Gratiot.....	8	"
" from 8 inch main in Gratiot to s. line of Ferry.....	6	"
Trounby ave., from Crystal to 7 ft. e. of St. Aubin.....	4	"
" from Chene to 72 ft. e. of Ellery.....	4	"
" from 72 ft. e. of Ellery to Mt. Elliott and crossing Collins.....	6	"
Trowbridge ave., from 16-inch main to e. line of Woodward.....	6	"
" e. from Woodward 511 ft.....	4	"
Trumbull ave., from Abbott to alley s. of.....	10	"
" n. from Abbott 30 ft.....	6	"
" from Michigan to Plum.....	6	"
" from Grand River to alley n. of.....	6	"
" from Brigham to Forest.....	8	"
" from Forest to 497 ft. n. of G. T. Ry.....	6	"
" from 50 ft. n. of Piquette to Holden.....	6	"
" alley e. of, from Plum to Sycamore.....	6	"
" alley w. of, from Cherry to Pine.....	3	"
" alley w. of, from Pine to Myrtle.....	4	"
" alley w. of, from alley n. of Grand River to Brigham.....	6	"
Tuscola st., alley n. and s. of, from alley w. of Fourth to Crawford.....	4	"
Twelfth st., from 458 ft. s. of River st. to Lafayette.....	4	"
" from Howard to Baker.....	4	"
" from Baker to Brigham.....	6	"
" from Brigham to s. line of N. Boulevard.....	8	"
" from s. line of N. Boulevard to 24-inch main.....	10	"
" 300 ft. e. of, from Porter to alley n. of.....	4	"
Twentieth st., from Fort to Michigan.....	6	"
" alley e. of, s. from Rose 197 ft.....	3	"
Twenty-first st., from Fort to Standish.....	4	"
Twenty-second st., from Fort to Dalzelle.....	6	"
Twenty-third st., from Fort to Magnolia.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Twenty-third st., from Magnolia to 35 ft. n. of Linden.....	3	iron.
" from 35 ft. n. of Linden to L. S. R. R.....	4	"
" from 163 ft. s. of Buchanan to Warren....	6	"
" from 278 ft. s. of Merrick to Kirby and crossing Mc- Graw.....	6	"
" from Kirby to s. line of McGraw.....	4	"
Twenty-fourth st., from River st. to Fort.....	4	"
" from Fort to Baker.....	6	"
" from Baker to 30 ft. n. of Michigan.....	8	"
" from 30 ft. n. of, to 54 ft. n. of Michigan.....	12	"
" from 54 ft. n. of, to 96 ft. n. of Michigan.....	16	"
" from 96 ft. n. of, to 181 ft. n. of Michigan.....	18	"
" from 181 ft. n. of, to 236 ft. n. of Michigan.....	20	"
" from 236 ft. n. of Michigan to Butternut.....	24	"
" from Butternut to Buchanan.....	10	"
" from Buchanan to n. line of McGraw.....	8	"
Twenty-fifth st., from Howard to Baker.....	4	"
" from Baker to 100 ft. s. of Toledo.....	6	"
" from E st. to Michigan.....	4	"
" from Michigan to Linden.....	6	"
" n. from Linden 192 ft.....	3	"
" from 595 ft. s. of Buchanan to Hancock.....	6	"
" from 72 ft. s. of, to n. line of McGraw.....	6	"
Twenty-sixth st., from 213 ft. s. of E st. to Buchanan.....	6	"
" from 152 ft. s. of, to 491 ft. n. of Hancock.....	8	"
" from 410 ft. s. of Kirby to McGraw.....	6	"
Twenty-seventh st., from Myrtle to Monteith.....	6	"
" crossing Buchanan.....	8	"
" from Beaver to Warren.....	6	"
" from 94 ft. s. of Merrick to Hudson.....	6	"
Twenty-eighth st., from Michigan to 14 ft. n. of Rich.....	6	"
Twenty-ninth st., from 565 ft. s. of Michigan to Buchanan.....	6	"
Union st., from Fourth to Fifth.....	3	"
Uthes st., from Clark to McKinstry.....	4	"
Van Dyke ave., from Jefferson to 150 ft. n. of Waterloo.....	8	"
" from Mack to Gratiot n. line.....	8	"
" from Gratiot to Centre Line road.....	6	"
Vine st., from Fourth to Fifth.....	3	"
Vinewood ave., from Fort to Buchanan.....	24	"
" from Fort to 430 ft. n. of Toledo.....	6	"
" from F st. to Buchanan.....	6	"
" from Buchanan to Merrick.....	10	"
" s. from Grand River 300 ft.....	8	"
Visgar st., from Vinewood to La Salle and crossing Scotten e. side.....	6	"
" from Lovett to Twenty-eighth.....	6	"
Volunteer ave., w. from Junction 315 ft.....	4	"
" e. from Dragoon 196 ft.....	4	"
Wabash ave., from n. line of M. C. R. R. to Ottawa.....	6	"
" from Ottawa to s. line of Grand River.....	4	"
" crossing Grand River, Warren and N. Boulevard.....	6	"
" from n. line of Grand River to s. line of L. S. R. R.....	34	wood
" from s. line of L. S. R. R. to 186 ft. n. of Piquette.....	6	iron.
" alley e. of, from 135 ft. s. of Butternut to Myrtle.....	34	wood.
" alley e. of crossing Myrtle.....	4	iron.
Walker st., from Atwater to Jefferson.....	4	"
Warren ave., from Second to Third.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Warren ave., from Fourth to Crawford.....	3 1/4	wood.
" from Crawford to 106 ft. w. of Seventh.....	4	iron.
" from Avery to alley w. of Wabash.....	4	"
" from Fourteenth to Sixteenth.....	4	"
" from 66 ft. w. of Humboldt to 106 ft. w. of Vinewood.....	6	"
" from e. line of Scotten to La Salle.....	6	"
" from w. line of Cass to 106 ft. e. of Riopelle.....	4	"
" from Warren court to Grandy.....	4	"
" crossing Collins.....	6	"
" e. from Helen 148 ft.....	4	"
Warren court, from 181 ft. s. of, to 56 ft. n. of Warren ave.....	4	"
Washington ave., from Michigan to State.....	30	"
" from Michigan to Park.....	10	"
" alley e. of, from alley n. of Michigan to alley s. of Park.....	4	"
" alley w. of, from alley n. of Michigan to alley s. of Park.....	4	"
Waterloo st., from Dequindre to Jos. Campau.....	4	"
" from Jos. Campau to alley e. of McDougall.....	6	"
" alley e. of McDougall to Elmwood.....	4	"
" e. from Elmwood 563 ft.....	3	"
" from 562 ft. e. Elmwood to w. line of Burlage pl.....	4	"
" from Burlage pl. to Mt. Elliott.....	8	"
" from Mt. Elliott to 57 ft. e. of Beaufait.....	4	"
Watson st., from Woodward to Brush.....	4	"
" from Brush to Reservoir.....	24	"
" from Dequindre to Chene.....	4	"
Wayne st., s. from Woodbridge 173 ft.....	4	"
" from Woodbridge to Michigan.....	6	"
Webster pl., from alley w. of Eighteenth to Nineteenth.....	4	"
" e. from Twenty-second 340 ft.....	2 1/4	wood.
Weich ave., from Plumer to s. line of M. C. R. R.....	6	iron.
" from 211 ft. s. of, to 309 ft. n. of Stark.....	6	"
" from s. line of Ingersoll to n. line of city limits.....	6	"
Wesson ave., from Toledo to L. S. R. R.....	6	"
" from n. line of G. T. Ry. to Leavitts.....	6	"
" from D., L. & N. Ry. to 190 ft. n. of Herbert.....	6	"
Western Hay Market, w. from Trumbull 171 ft.....	3	"
Westminster ave., from 16-in. main to 1222 ft. e. of Woodward.....	6	"
Whitaker ave., e. from Russell 779 ft.....	4	"
Whiting ave., e. from Jos. Campau 1890 ft.....	4	"
Widman pl., from Harper to 55 ft. n. of Piquette.....	6	"
Wight st., from Chene to Leib.....	4	"
" from Leib to 110 ft. e. of Meldrum.....	6	"
" alley s. of, e. from McDougall 230 ft.....	4	"
Wilcox st., from Woodward to Miami.....	12	"
Wilkins ave., from 16-in. main to w. line of Woodward.....	6	"
" from w. line of Woodward to e. line of Crawford.....	4	"
Wilkins st., from Brush to Russell.....	4	"
" from 156 ft. w. of Riopelle to Orleans.....	4	"
" from Orleans to 30-in. main in Chene.....	8	"
Williams ave., from Michigan to 196 ft. n. of Breckenridge.....	6	"
" from n. line of Merrick to Hudson.....	6	"
Williams rd., from 16-in. main to w. line of Woodward.....	6	"
Willis ave., from Woodward to Beaubien.....	4	"
" from Beaubien to St. Antoine.....	3	"
" from St. Antoine to Hastings.....	2 1/4	wood.
" e. from Hastings 356 ft.....	4	iron.

LOCATION.	DIAM. INCHES.	KIND.
Willis ave., from 356 ft. e. of Hastings to Rivard	3	iron.
" from Rivard to the w. line of Russell.....	3	wood.
" from the w. line of Russell to the e. line of Chene.....	4	iron.
" from the e. line of Chene to Grandy.....	3	"
" from Jos. Campau to w. line of McDougall	2½	wood.
" crossing Mitchell	4	iron.
" from w. line of, to 291 ft. e. of McDougall.....	4	"
" e. from Collins 146 ft.....	4	"
" e. from Moran 984 ft.....	4	"
" from Woodward to Third.....	6	"
" from Fourth to Crawford.....	4	"
" from Sixth to Eighth.....	4	"
" e. from Twelfth 215 ft.....	3	wood.
" crossing Twelfth.....	4	iron.
Winder st., from Woodward to Orleans.....	4	"
Wing place, from alley w. of Eighteenth to Nineteenth.....	4	"
Winslow ave. n. from Grand River 85 ft.....	4	"
" from 65 ft. n. of Grand River to McGraw.....	6	"
Winter st., e from Dequindre 431 ft.....	4	"
Witherell st., from e. line of Woodward to Miami.....	16	"
" from Woodward to Miami.....	6	"
" from Miami to Adams.....	4	"
" from Adams to alley n. of.....	3	"
Wolff st. e. from Scotten 357 ft.....	4	"
Woodbridge st., from Randolph to Brush.....	4	"
" w. from St. Antoine 220 ft.....	3	"
" from St. Antoine to Rivard.....	4	"
" from Rivard to Russell.....	3	"
" from Russell to Orleans.....	4	"
" from Orleans to Dubois	6	"
" w. from Joseph Campau 300 ft.....	2½	wood
" e. from Joseph Campau 400 ft.....	4	iron.
" crossing Leib w. side 24 ft.....	4	"
" w. from Leib 300 ft.....	2½	wood
" alley s. of, from Bates to Randolph.....	4	iron.
" alley s. of, from Brush to 210 ft. e. of Beaubien.....	3	"
" crossing Woodward.....	8	"
" from Woodward to Griswold.....	6	"
" from Griswold to First.....	4	"
" from First to Second.....	6	"
Woodland ave., from 16-in. main to e. line of Woodward.....	6	"
" e. from Woodward 780 ft.....	4	"
Woodward ave., from Atwater to Jefferson.....	16	"
" (e. side) s. from Atwater 246 ft.....	3	"
" (w. side) s. from Atwater 171 ft.....	4	"
" from Jefferson to Soldiers' monument.....	24	"
" from Atwater to Adams.....	8	"
" from Adams to Baltimore.....	10	"
" from Baltimore to Pallister.....	8	"
" from N. Boulevard to Woodland.....	16	"
" from High to 200 ft. n. of Canfield.....	4	"
" from Bagg to Edmund place.....	24	"
" alley e. of, from alley s. of Atwater to alley s. of Jeffer- son.....	4	"
" alley e. of, from alley n. of Jefferson to alley n. of Con- gress.....	4	"

LOCATION.		DIAM. INCHES.	KIND.
Woodward ave.,	alley e. of, from alley s. of, to Gratiot.....	6	iron.
63	alley e. of, n. from Gratiot 130 ft.	8	"
64	alley e. of, from 130 ft. n. of Gratiot to alley s. of With- erell.....	4	"
65	alley e. of, from alley s. of, to Elizabeth.....	3	"
66	alley e. of, crossing Elizabeth.....	4	"
67	alley e. of, from Columbia to Montcalm.....	4	"
68	alley w. of, from Atwater to alley s. of Jefferson....	4	"
69	alley w. of, from alley n. of Jefferson to Larned.....	4	"
70	alley w. of, from Larned to Congress.....	8	"
71	alley w. of, from Congress to alley n. of.....	4	"
72	alley w. of, from alley n. of Michigan to alley s. of Park.....	4	"
73	alley w. of, from Montcalm to High.....	3	"
Woodward ave.	terrace, from Woodward to w. line of John R.....	4	"
Wreford ave.,	from Eighteenth to Grand River.....	4	"
Zender place, w.	from Mt. Elliott 354 ft.....	4	"



CITY OF DETROIT,

HEALTH OFFICE,

November 2d, 1892.

ANALYSIS OF DETROIT RIVER WATER.

Grains per Wine Gallon.

	S. P. Duffield, Ph.D., M.D.	A. B. Lyons, M.D.	S. P. Duffield, Ph.D., M.D.
	1861	1879	1892
Potassic Chloride.....	.1445		
Sodic Chloride.....	.3605	.229	.2389
Sodic Carbonate.....	.0000	.394	.3941
Calcic Sulphate.....	2.5810	1.043	1.0430
Calcic Carbonate.....	1.6518	3.353	3.3520
Magnesian Chloride.....	.1847		
Magnesian Carbonate.....		1.209	1.2100
Aluminum Phosphate.....	.0844		
Alumina.....	.5926	.241	2.4500
Ferrous Carbonate.....	.5060	Trace	*Strong trace
Silicic Anhydride.....	.2625	.306	.3060
Total.....	6.3700	6.775	6.7790

* Solids from one liter show iron distinctly.

Parts per Million.

Free Ammonia.....	Process not	.050	.02087
Albuminoid Ammonia.....	known in	.125	.02500
Total Mineral Solids.....	1861.	115.160	115.22000
Volatile and Organic Matters.....		15.000	15.10000
Chlorine.....		2.100	2.10100

The first column gives my analysis made in 1861, before we had reached the fine estimation of Albuminoid Ammonia, the process not having been even dreamed of then. I cannot understand how Dr. Lyons' analysis shows so much Albuminoid Ammonia per million parts, as Prof. Prescott's and my analysis do not show anything like that amount. The season of the year and the condition of Lake St. Clair and its tributary

streams will influence that greatly. Albuminoid Ammonia does not point to any sewage contamination necessarily, but should there be any suspicions that the water was receiving sewage, then it should be a guide as to the quantity. I think, coupled with estimations of chlorides, nitrates, nitrites, etc., that a pretty fair opinion can be formed of the water. Next year I will take water at different points in the river, and especially about the time of spring freshets. The water now is very pure, but we cannot say it will read as well when the spring storms come. I think that the typhoids which show themselves in our city must originate from either bad drainage, sewage or from bad water drunk outside our city.

Yours respectfully,

SAMUEL P. DUFFIELD, M.D.,

Health Officer.

ANALYSES OF DETROIT ICE AND DRINKING WATER.*

BY J. E. CLARK, M. D.,

Professor of Chemistry and Physics, Detroit College of Medicine, and Professor of Chemistry and Toxicology, Department of Pharmacy, Detroit College of Medicine.

I wish to present to this society, for its consideration to-night, the result of numerous analyses conducted by myself and assistants during the past year, on the ice and water supply of our city, for the purpose of determining, so far as the chemist can determine, the healthfulness of the supply.

The work has been laborious but interesting, and we trust that, in giving it to the public, its results may be in some degree appreciated.

The analyses of water are from samples taken from hydrants during the different seasons of the year, and are not the result of one but of many analyses. The details of the various analyses would be tedious and uninteresting, so I have confined myself to giving the maximum and minimum amounts found. The mean can be readily arrived at. The variation of the two extremes was but .002 parts per million of free ammonia, and but .005 in albuminoid ammonia, showing a remarkable constancy in the purity of our water supply.

I cannot say as much, however, for our ice supply. The majority of the samples were good, but some were evidently contaminated by sewage. This is a matter wholly under control of the proper authorities, and should receive the attention its importance demands. Some of the samples of ice were obtained directly from dealers and others from drug stores, meat shops, etc., in different parts of the city.

A pure water supply is easily rendered worthless, if, during the months we are most prone to sickness, it is contaminated from a foreign source.

In these analyses I sought for indications of sewage contamination, but with the exception of two samples of ice, I found no evidence to support such a theory. Recent investigations have shown that the real

danger to health lies not so much in the substances found by the chemist in his investigations, which are *per se* harmless, but in certain micro-organisms beyond the domain of purely chemical investigations, and it had become somewhat the fashion to lessen the importance attached to a chemical analysis, until it was shown that the liability of the presence of pathological micro-organisms was in direct ratio to the chemical impurity of the water, viz., its fitness to sustain them.

Thus, while a chemical analysis does not positively isolate a typhoid fever cause, it demonstrates very clearly the possibility of its existence in a given water. A water containing neither ammonia, free or in combination, nor chlorine can never develop a case of typhoid fever. These germs are always accompanied by organic matter, the nature of which determined by the chemist gives its origin and significance.

In the analyses my first endeavor was to discover any organic contamination which might inferentially lead to a suspicion of sewage pollution, such as free and albuminoid ammonia.

Secondly, to find water which might in itself be considered as dangerous, or as giving positive evidence of sewage contamination, such as chlorine. In Detroit river water, chlorine in any marked quantity cannot come from an innocent source, its presence therefore must be accepted as evidence of sewage. The amount of chlorine found, 2.0 parts per million, in our water can easily arise from an innocent cause, but the amount found in a sample of ice, 65 parts per million, can only be accounted for on the supposition of an admixture of animal excreta.

I have confined myself to giving the amounts of free ammonia, albuminoid ammonia, oxygen consumed and chlorine

*Read before the Detroit Chemical Society and contributed to the *Pharmaceutical Era*.

contained in the ice and water, these being the more important factors in determining the amount and quality of organic material present and at the same time, the probable sanitary conditions. The presence of free ammonia of itself means very little, being frequently absorbed from the atmosphere by the waters near large cities, but the additional presence of albuminoid ammonia invests it with a significance at once apparent.

The story of the present dangerous contamination of drinking water is told by the amount of this substance actually present. No arbitrary rule as to the precise point at which a given sample of water becomes impure as indicated by the albuminoid ammonia present, can be established, but it is generally agreed that the classification might be somewhat as follows:

Class I.—Water of great organic purity, yielding not more than 0.041 parts of albuminoid ammonia in 1,000,000.

Class II.—Water of medium purity, yielding from 0.041 to 0.082 parts of albuminoid ammonia in 1,000,000.

Class III.—Water of doubtful purity, yielding from 0.082 to 0.123 part albuminoid ammonia in 1,000,000.

Class IV.—Impure water, yielding more than 0.123 albuminoid ammonia to 1,000,000.

Referring to the table appended, it will be seen that the maximum amount of albuminoid ammonia found by us in our water is well within the first-class, of water of "great organic purity." Our sister city, however, (Windsor), using water from the same source, approaches very nearly Class III, "water of doubtful purity." This can be accounted for from the fact that that city's intake is from a point below the Walkerville sewer. That Windsor water contains 0.07 parts of albuminoid ammonia per million is not in itself significant, but when taken in connection with the fact that the water farther up stream contains less than half this amount, it seems to point most positively to some foreign contamination before it reaches the consumers.

I give also the amount of oxygen consumed as this bears a direct relation to the amount of organic material contained in the water and is a valuable indicator, its significance being classified by Drs. Frankland and Tidy as follows:

Class I.—Of great organic purity, absorbing not more than .50 part per million.

Class II.—Of medium purity, absorbing not more than 1.5 part of oxygen per million.

Class III.—Of doubtful purity, absorbing not more than 1.5 to 2.0 part of oxygen per million.

Class IV.—Impure water, absorbing more than 2.0 parts of oxygen per million.

In this particular it will be seen that Detroit water is again superior, but it is to be remembered that vegetable debris itself harmless, will greatly increase both the albuminoid ammonia and the oxygen consuming power of the water so that to form an intelligent opinion of the value of a given water it is necessary to have a knowledge of the normal waters of the vicinity. While an excess of these factors may necessarily demonstrate the impurity of the water containing them, their absence from a water is proof of its purity.

Chemical analysis cannot discover noxious ingredient or ingredients in water polluted by infected sewage or animal excreta, and as it cannot thus distinguish between infected and non-infected water, the only perfectly safe course is to avoid altogether the use, for domestic purposes, of water which has been polluted by excrementitious matters.

Again, referring to the table, it will be seen that the amount of chlorine found in Detroit water is less than that found in any other city, excepting Rochester. A small amount is always found in all natural waters, being derived from the sodium chloride (common salt) which is abundantly distributed in all rocks and soils.

Sewage, the polluting agent most dreaded in water, contains a large proportion of chlorine, as common salt, derived mostly from the liquid excreta of animals. The proportion of chlorine in uncontaminated waters is very constant, hence marked excess over the normal standard, unless otherwise accounted for, suggests a direct contamination.

The analysis of Windsor water, made by Anthony McGill, B. A., of the Inland Revenue Department, Ottawa, (and of the American cities, by A. R. Lead

So far as the analysis of the ice is concerned, it must be borne in mind that impurities found do not indicate the age existing in the mass of water from which it was formed. Coming as it does from the surface and usually from

Table Showing the Relative Purity of Water Supplied to Principal Cities.

Parts per Million.	Philadelphia.	New York.	Brooklyn.	Jersey City.	Boston.	Washington.	Rochester.	Cincinnati.	Detroit.		Windsor.
									Maximum.	Minimum.	
solids.....	148.0	118.0	60.0	98.0	85.0	115.0	100.0	168.0	128.0	161.0	104.
lime.....	3.0	3.5	5.5	2.35	3.15	2.70	1.95	8.05	2.73	2.49	3.5
type consuming pow'r }	4.6	8.1	4.13	9.5	17.7	6.00	7.9	8.6	.711	.669	15 min., .394
albuminoid ammonia.....	.147	.221	.067	.344	.406	.221	.188	.196	.025	.03	.07
free ammonia.....	.008	.022	.006	.089	.108	.490	.068	.094	.012	.010	4 hours, .812

Result of the Analysis of Six Samples of Ice Collected 1891-1892.

Parts per Million.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	Nos. 5 and 6
free ammonia.....	.05	.12	.16	.22	.39	.39	unequivocally
albuminoid ammonia.....	.39	.16	.17	.39	1.07	1.42	show sewage
type consumed.....	4.4	2.2	1.9	1.8	3.74	9.06	contamination.
lime.....	4.8	5.0	4.75	4.80	15.50	62.45	

one would expect to find a greater quantity of organic vegetable debris, etc., the hypothesis of the kind can explain the large amount of chlorine and corresponding albuminoid ammonia in Nos. 5 and 6, besides the freezing of water tends to purify it. It has been found that 20 per cent of the colloid and more than this of the crystalloid impurities of water are removed by congelation.

There are many apparently unsurmountable causes to account for the greater impurities in the ice, such as its location near the surface of the water, its liability to remain in its structure material washed from the atmosphere by light snow or rain storms, and the methods employed in handling and harvesting the crop. While watching the harvesting of the crop last winter I frequently saw animal excreta, both liquid and solid, dropped upon the ice, no special effort other than a shovel being used to remove it. Ice-men, in their own interests, should see to it that no rough attempts are thus made to purify it, but they should condemn it and all ice in its immediate vicinity. A piece of ice of this nature coming into the hands of the chemist would furnish evidence to condemn tons of otherwise pure material. Good ice should be as pure as our drinking water. Prof. Nichols concluded that it should hold next to no chlorine, and should yield not more than .06 of albuminoid ammonia per million.

In these analyses I have been ably as-

sisted by W. H. Allen, Ph. C., of the Department of Pharmacy of the Detroit College of Medicine, and others, to whom my thanks are due.

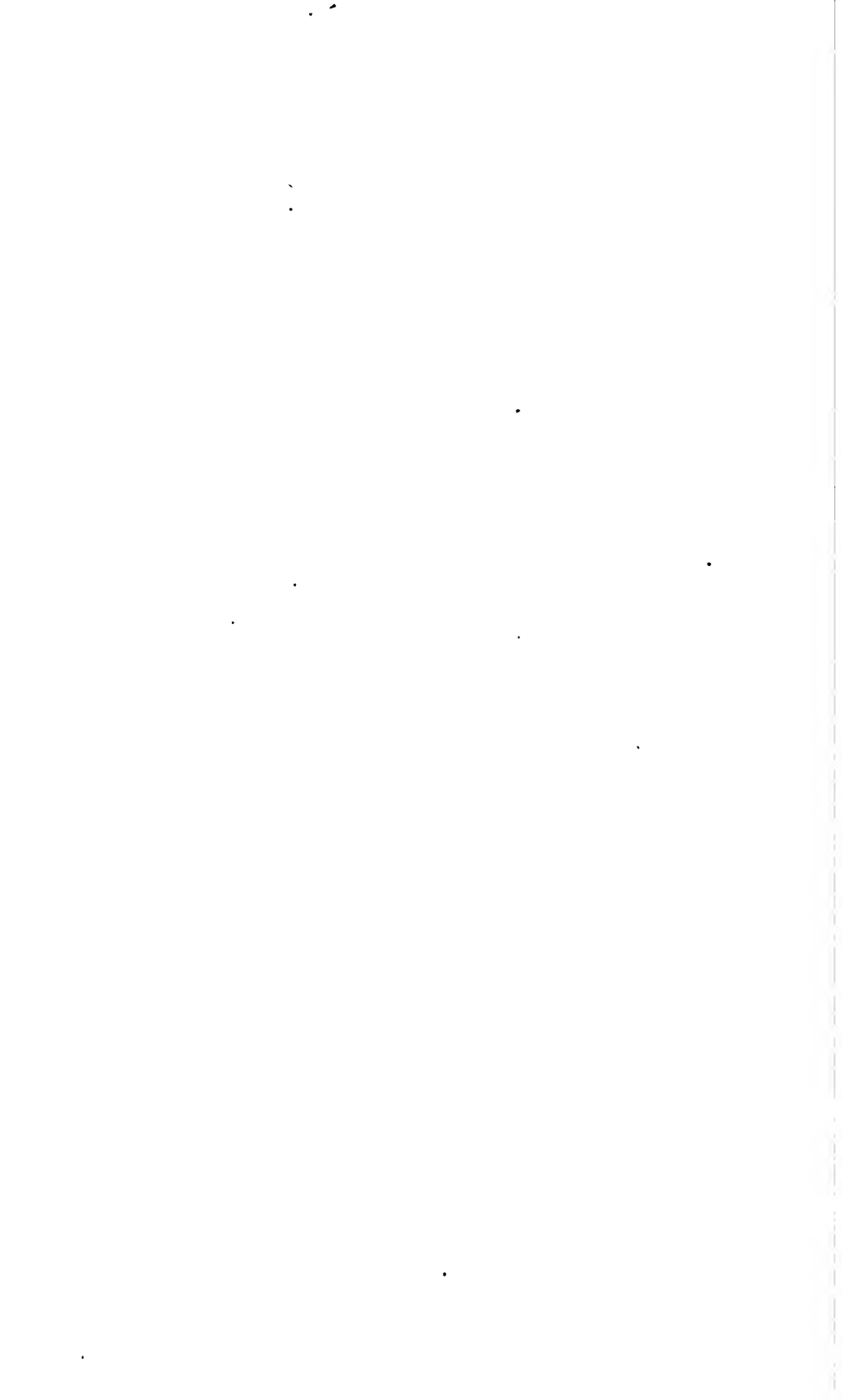
The methods followed were: For the free ammonia, Nessler's solution to the distillate; for the albuminoid ammonia, potassium permanganate and sodium hydrate, afterwards nesslerizing the distillate; for the quantity of oxygen consumed in three hours, I followed Forehammer's process.

The chlorine present cannot be estimated in our waters except in concentrated solution, made by evaporating considerable quantities of the water. In some samples of the ice, however, the estimation could be readily effected without evaporation.

In April, 1891, I was employed by the *Detroit Evening Journal* to make a comparative analysis of Windsor and Detroit water supply. In looking up my notes I find the analysis of Windsor water to be as follows. It was very variable, depending upon the direction of the wind and the day of the week. The maximum and minimum of my analysis were as follows:

Parts per Million.	
Free ammonia—Maximum.....	.30
“ “—Minimum.....	.02
Albuminoid ammonia—Maximum.....	.11
“ “—Minimum.....	.03
Chlorine (one analysis).....	3.80

The result of my analyses demonstrates clearly that the water supply of our city is unexcelled for purity by that supplied to any other large city in the union.



FORTY-SECOND

ANNUAL

REPORT

OF THE

BOARD

BOARD OF WATER COMMISSIONERS



NEW YORK: 1893.

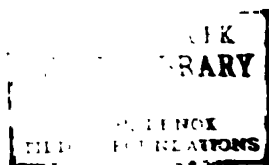
TO THE

COMMON COUNCIL OF THE CITY OF DETROIT

FOR THE YEAR

1893.

*8/1/94 C.
Ed. note,
p. 17*



FORTY-SECOND ANNUAL REPORT

OF THE

Board of Water Commissioners

TO THE

COMMON COUNCIL OF THE CITY OF DETROIT,

TOGETHER WITH THE

REPORTS OF THE OFFICERS OF THE BOARD

FOR THE YEAR 1893.

DETROIT:

THE DETROIT FREE PRESS PRINTING COMPANY.

1894.

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BOARD OF WATER COMMISSIONERS.

DETROIT, 1893.

MEMBERS:

JOSEPH L. HUDSON, 1892. AUGUST GOEBEL, 1894.
SAMUEL G. CASKEY, 1893. HENRY M. DUFFIELD, 1895.
FRANK E. KIRBY, 1896.

COMMITTEES:

WAYS AND MEANS	Commissioners	DUFFIELD, HUDSON.
EXTENSION AND CONSTRUCTION..	Commissioners	HUDSON, KIRBY.
PUMPING WORKS.....	Commissioners	KIRBY, CASKEY.
SUPPLIES	Commissioners	CASKEY, DUFFIELD.

OFFICERS:

PRESIDENT	AUGUST GOEBEL.
VICE-PRESIDENT.....	FRANK E. KIRBY.
GENERAL SUPERINTENDENT	} L. N. CASE.
SECRETARY	
CIVIL ENGINEER.....	G. S. WILLIAMS.
SUPT. OF EXTENSION.....	HENRY BRIDGE.
SUPT. OF METERS AND INSPECTION	THOMAS R. PUTNAM.
SUPT. OF GROUNDS.....	E. A. SCRIBNER
CHIEF ENGINEER.....	URIAH GOULD.
FIRST ASSISTANT ENGINEER.....	THOMAS SPACKMAN.
CONSULTING ENGINEER.....	JOHN E. EDWARDS.
METER CLERK.....	HARRY S. STARKEY.
	FRED. H. HUTAFF.
	AUGUST GOEBEL, JR.
	JOHN J. ROBINSON.
ASSESSORS AND COLLECTORS	PETER J. BECKER.
	THOS. W. GOODALE.
	ANTHONY VOGEL.
	CHARLES J. PATERSON.
	GEORGE A. WINSLOW.
RECEIVING CLERK.....	GEORGE E. KUNZE.
PERMIT CLERK.....	JOHN E. LONG.

DETROIT WATER WORKS.

METER RATES.

From 1,000 Cubic Feet, each month, each 100 gallons.....	$\frac{3}{4}$ of a cent
and over, each 100 gallons.....	$\frac{1}{2}$ of a cent

ASSESSMENT RATES.

FROM JULY 1st, 1886.

	PER ANNUM
For Family, household purposes.....	\$5 00
Green Houses.—Special rates.	
Private Stables, for each horse.....	2 00
Livery Stables, " " ".....	2 00
Bray and Team Horses, each.....	1 00
Cows, each.....	1 00
Stores and Offices.....	\$2 00 to 20 00
Bakeries, average daily use, for each barrel of flour.....	3 00
Saloons, Groceries and Provision Stores, from.....	\$3 00 to 100 00
Bar, with faucet, from.....	8 00 to 20 00
Fish Houses.....	10 00 to 100 00
Slaughter Houses.—Special rates.	
Hotels and Taverns, in addition to family rate, each room.....	1 00
Boarding Schools, each room.....	1 00
Public Schools, from.....	\$5 00 to 50 00
Building Purposes, each 1 M brick.....	5
" " " 100 yards plastering.....	10
" " " perch stone.....	14
Printing Offices.—Special rates.	
Butcher Stalls, each not less than.....	2 00
Workshops, for 10 persons or under.....	1 00
" for each additional 10 persons.....	1 00
Estimated quantities of water each 100 gallons.....	2
Boarding Houses, in addition to family rate, each boarder.....	1 00

FIXTURES.

Bath Tubs, for families, 1st tub, \$3; each additional.....	\$1 00
Bath Tubs, public, each tub.....	5 00
Water-closets, for a family, 1st closet, \$3 00; each additional, \$2 00.....	\$3 00 to 15 00
Water-closets, for Hotels, Stores, Factories, etc., for ten persons, \$5 00; each additional person.....	25
Red Water-closets, not less than.....	6 00
Urinals, not less than.....	2 00
Wash-Hand Basins, for family.....	\$1 00 to 3 00
" " " for other purposes, each person.....	25
Permanent Wash Tubs.....	2 00
Hose, for lawn and street sprinkling purposes.....	free.
Hose, for other purposes.....	\$3 00 to 20 00
Fountains.....	5 00 to 20 00
Street Sprinklers, each wagon.....	150 00

Where there is a waste of water a proper increase of rates will be made.

REPORT
OF THE
BOARD OF WATER COMMISSIONERS
OF THE
CITY OF DETROIT.

WATER COMMISSIONERS' OFFICE,
DETROIT, January 30th, 1894.

To the Common Council of the City of Detroit:

GENTLEMEN—The Board of Water Commissioners respectfully submit their annual report for the year ending December 31st, 1893. The reports of their subordinate officers, covering in detail the operations of the Board, are in the hands of the printer, and will be presented to your honorable body immediately upon their completion.

As reported in our last annual report, the litigations growing out of the Hurlbut will had then been adjusted, and therefore your Commissioners were at liberty to enter upon certain expenditures to improve and beautify the Water Works Park.

During the last year an iron fence, running along the entire frontage of the grounds and one hundred feet back from the front upon each side, has been constructed. A contract has also been entered into for the construction of a gateway costing \$30,000. This was designed to be a memorial tribute to Mr. Hurlbut, and for this reason is styled, and the words

FOURTY-SIXTH ANNUAL REPORT OF THE

on its front, "The Hurlbut Memorial Gate." This
 has been completed at the present time.

The improvements, together with others being made in
 the park, is increased floral display, the planting of orna-
 mental shrubbery and trees, and the reclaiming of the marshy
 lands near its western frontage on the river,
 and the construction of a miniature canal and islands, will render the park
 more attractive and fully as interesting as any in the city.

The new engine contracted for about one year ago is very
 well equipped.

During the year, \$146,000 of bonds came due. It became
 necessary for the redemption of these bonds, to effect a loan
 of \$146,000 for one year, and which was done by procuring the
 purchase of bonds to that amount and for the said time at six
 per cent interest.

The expenses during the past year for general construction
 have been large. The readjustment of our pipeage system, the
 results of which will be found in the Civil Engineer's report,
 has been accomplished at an expense of about \$78,000. The
 results attained are very apparent to many of the consumers,
 who have hitherto been much annoyed by short supplies and
 low pressures, and are fully set forth in the report above
 referred to.

We have labored to meet the fullest needs of the city, and
 at the same time preserve the economy of our administration.
 The results, as set forth in the following comparative statement
 for the years 1888 to 1893, fully justify this statement:

YEARS.	Population	Operating Expenses
1888	194,247	\$93,783 50
1889	205,598	93,931 00
1890	215,803	93,746 85
1891	230,051	98,066 67
1892	240,563	91,534 83
1893	257,050	93,031 40

From this it appears that with a population in 1893 of 63,000 more people to supply than in 1888, with all the attendant growth of manufacturing and business interests, the operating expenses were more than \$1,700 less than in 1888. Almost all this saving is attributable to the use of meters by all large consumers. Upon a conservative estimate, the annual saving from the use of meters alone is not less than \$50,000. This is not only a saving in the expense to the city, but, with very few exceptions, a reduction of the cost to manufacturers and metered consumers.

The suggestion that is made to abolish water rates and raise the necessary expenses of a water supply by general taxation, will, upon reflection, be seen to be so utterly impracticable and chimerical that it does not merit discussion.

The detailed statement of expenditures already submitted to your honorable body, for the year 1893, and those regularly submitted every January for each previous year, prove conclusively that no public funds have been used by this Board to influence any proposed legislation respecting the Board, and the undersigned supplement this evidence with their several denials that anything of the kind has ever occurred during their respective terms of office, and repudiate any statements or insinuations to that effect as wholly false and without any justification. Whatever may be the case in other departments of the municipal government, the Board of Water Commissioners cannot be pilloried in court for unlawfully using its funds with the legislature, or for any purposes foreign to the object for which it was created.

All of which is respectfully submitted.

AUGUST GOEBEL,
SAMUEL G. CASKEY,
HENRY M. DUFFIELD,
FRANK E. KIRBY,
JOSEPH L. HUDSON,

Commissioners.

REPORT

OF THE

GENERAL SUPERINTENDENT AND SECRETARY.

JANUARY 2d, 1894.

To the Board of Water Commissioners:

GENTLEMEN—I respectfully submit my report of the general operation and construction of the works for the preceding year, together with statements of the financial transactions of the Board.

CONSTRUCTION.

The construction of the works may be divided into two classes, ordinary and extraordinary. The ordinary construction is that which is included in the extension of pipe to keep pace with the growth of the city, the purchase and placing of meters, and such other incidentals as naturally occur in each department. The extraordinary is the laying of large supply mains, the purchase of new machinery, and the erection of buildings, in fact what may be called the enlargement of the works.

The entire expenditures for construction were \$378,048.94, of which \$210,152.52 was for extraordinary construction, less \$11,000, excess of pipe on hand this year over last. This amount includes \$110,572.47 expended at the pumping works for the new engine, the enlargement of the engine and boiler houses, the building of a new conduit, and the rearrangement and addition to the system of force mains within the grounds. Additional to this is the expenditure of \$22,049.56, chargeable to the Hurlbut Fund, and expended for the construction of the iron fence, the Hurlbut Memorial Gateway, and the general improvement and care of the grounds, making the total of extraordinary construction \$232,202.08.

It includes about \$78,634.45 expended in readjusting the general

PIPEAGE SYSTEM.

In my report for the year 1891, I referred at some length to the great differences in pressures throughout the city. I stated that I had placed, through the courtesy of the Fire Department, in different engine houses, thirteen pressure gauges, and had had a record made of their readings every hour.

This idea was the outgrowth of numerous and constant complaints having been made to me of short supplies and low pressures in certain localities, and was adopted simply to obtain absolute and reliable information.

I reported also at that time that certain gates controlling the supply of water to these localities where the pressures were unusually large had been partially closed, which had the effect only of partially curing the evil.

With the very limited knowledge of engineering that I possessed, or was had by any of the then employes of the Board, it was impossible to arrive at the true cause that was producing this *unhealthy* condition, and not knowing the cause, it was impossible to cure it. This condition continued to exist, with but little variation, during the succeeding year of 1892. Early in the year just passed, a civil engineer was employed by the Board, and reported to me for duty. I requested him to commence an immediate and thorough study of our entire pipeage system. I gave him the data I had collected, and asked him to report to me the results of his labors as soon as he possibly could.

That report was received and read to your honorable body, showing conclusively the mistakes that had been made and the steps necessary to take to remedy the evil.

His recommendations were concurred in, and he was instructed to carry out his plan for the rearrangement of the system.

This work and the results therefrom are best understood from his own report. I will simply refer you to the following

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statement, showing the elevations of water before and after the changes in the system had been made:

LOCATION.	FORMER ELEVATIONS.	PRESENT ELEVATIONS.
Corner Russell st. and Ferry ave.....	23.6 feet.	28.6 feet.
Alexandrine and Cass ayes.....	31.2 "	43.1 "
Russell and High sts.....	29.3 "	41.6 "
Gratiot and Grandy ayes.....	29.8 "	45.5 "
Grand River ave. and Sixteenth st.....	34.9 "	39.3 "
Woodward and Milwaukee ayes.....	19. "	40.5 "
Bagg and Sixteenth sts.....	44.1 "	46.7 "
Fort st. and Elmwood ave.....	44.8 "	52.2 "
Baker and Sixth sts.....	43.3 "	57.9 "
Scotten and Michigan ayes.....	51.5 "	53.2 "
Hubbard ave. and Fort st.....	58.9 "	58.9 "
Jefferson ave. and Randolph st.....	49. "	49.7 "
Bagley ave. and Clifford st.....	46. "	64.4 "

A water-works of the size and importance of Detroit, and in fact any water-works, is not complete without its civil engineer to advise and counsel with, and I congratulate the Board upon having procured one of unquestionable ability.

METERS.

The introduction of meters has continued during the past year, but not of course with as largely beneficial results as shown in the four years previous. One of the causes for this is the fact that most of the meters placed during the year were upon small consumers, the larger ones having already been metered. Up to this time meters have only been placed on business houses, stores, factories, etc., and hardly any, only by request, upon families. This fact alone would prevent any such showing as those of 1889, 1890, 1891 and 1892. Another cause for the increased amount pumped is this, that during the year the pressure of water has been materially increased. The average increase was five pounds, or what is equivalent to an extra elevation of nearly twelve feet, and twenty-eight per

cent. over the previous average. This increased pressure largely increases the quantity of water discharged through an orifice in a defective water pipe, or through a faucet purposely or accidentally left open.

The amount of water pumped each hour during the day and night indicates conclusively that during each hour about 800,000 gallons are wasted. This waste is undoubtedly very largely caused by constantly flowing streams, of greater or less size, throughout the whole system of supply, not only in defective service pipes and fixtures but in the pipeage system itself. I have already submitted this matter to the engineer and requested him to devise some means of investigating and locating the leaks that are existing in the supply and distribution mains, which will be probably attended to during the coming year. The work of the examiners under Superintendent Putnam is already accomplishing this work as far as service pipes and fixtures in houses are concerned.

I desire in this connection to introduce an article from the pen of Col. William Ludlow, a distinguished engineer of national reputation, and one who has been in a position to judge, and with an education and intellect to appreciate all of the features and influences that pertain to the subject of water supply, the necessity for preventing waste and the means that should be adopted to accomplish that result.

READ IT.

THE OPINION OF AN EXPERT.

Water waste arises from many causes—leaky mains and pipes, defective appliances of all kinds, lack of supervision of public openings, and the perpetual flow from horse-troughs, bar-rooms, hotels, private houses, etc. In addition, is the immense loss through factories and mills, where the pipes are constantly flowing, and which do not even shut off the water when the works are closed.

There are but two practicable methods of checking this waste, viz.: by a system of inspection and enforcement of penalties, and by measuring and charging for the quantity taken. The former plan involves domiciliary visiting, always cumbersome and objectionable, by an army of inspectors, subject to both obstruction and improper influences in the discharge of

their duties, and unless thoroughly systematized and maintained and aided by indirect instrumental determinations, is, in the nature of things, an approximation only to an effective method.

Actual measurement is preferable, as being more exact, automatic, effective and equitable. The water meter is merely a sleepless and tireless machine, not susceptible to bribery or violence without discovery, requiring little attention, and recording actual consumption regardless of the disposition made of the water which passes through it.

The two systems may be compared by supposing a given establishment to be furnished with gas at an annual rental, and its economical use dependent upon the carefulness of the occupants and an occasional visit by an inspector.

It is sometimes said that water should be as "free as air," and in truth it is to any one who chooses to procure it for himself, as light is free to him who goes to bed at dark; but he who wishes either light or water supplied to him, when and where and in such amount as he shall choose, must manifestly pay for it, and the meter will enable the department to make out just bills, and at the same time hold the water-taker responsible for the waste due to carelessness, willfulness or defective appliances. When this system has been intelligently carried out, as in some of the better managed cities, such as Providence, the results show that the legitimate consumption of water for all purposes is from thirty to forty gallons.

The argument that an undesirable economy might be exercised among a class of population whose use of water should be encouraged, may be met by fixing a minimum allowance and charging by meter for all beyond that.

It is natural, perhaps, that city officials should turn their attention to drawing from new sources and increasing the machinery of their department, rather than undertake the unpopular and thankless task of restricting waste. No one knows, who has not attempted it, how difficult it is to correct abuses of long standing. Few citizens are liberal or intelligent enough to voluntarily aid in securing a public benefit, or necessity even, if it must be accomplished at the cost of any inconvenience or restriction to themselves. Touch the purse-strings, however, and it can be done. With the meter registering waste, defective appliances will be repaired, carelessness of servants and employes corrected, the water closet will have a proper flushing tank instead of a constant flow, and the water will not be used in winter to protect a badly-laid pipe from freezing, or the owner from a plumbing bill.

The waste from these sources, though of no great apparent amount in a single instance, when multiplied by the immense number in use, represents a formidable quantity, which, having been brought at great expense from the source of supply, flows

to tide water without having served any useful purpose whatever.

[Signed]

COL. WM. LUDLOW.

HISTORICAL.

The following table is one published last year, with the addition of the results of 1893:

YEARS.	Families Supplied.	WATER PUMPED.		REMARKS.
		Total Quantity.	Per milly.	
1852.....	.....	235,840,275	.....
1853.....	4,283	303,531,743	70,868	
1854.....	4,619	376,265,126	81,460	
1855.....	5,282	542,807,364	102,765	
1856.....	5,706	692,124,305	121,297	
1857.....	6,189	697,190,523	112,650	
1858.....	6,474	718,091,207	110,919	
1859.....	6,794	782,112,537	115,118	
1860.....	6,750	870,086,451	125,185	
1861.....	7,128	895,129,423	125,579	
1862.....	7,275	994,945,329	136,762	
1863.....	7,699	1,035,798,043	134,534	
1864.....	7,993	1,019,390,256	127,410	
1865.....	8,351	1,040,514,887	125,675	
1866.....	9,089	1,106,317,922	131,622	
1867.....	10,242	1,425,535,230	139,186	Average per cent. of increase from 1852 to 1888— 12.86.
1868.....	11,544	1,666,545,125	144,364	
1869.....	12,774	1,946,810,325	152,400	
1870.....	13,722	1,866,060,068	136,000	
1871.....	14,896	2,300,150,605	154,414	
1872.....	16,035	2,782,292,578	173,513	
1873.....	17,019	3,198,393,948	187,930	
1874.....	18,853	3,289,872,635	174,511	
1875.....	19,606	4,207,454,260	214,600	
1876.....	20,102	4,065,134,470	200,225	
1877.....	20,345	4,213,239,790	207,090	
1878.....	20,603	4,345,743,330	210,927	
1879.....	21,341	5,129,599,110	240,348	
1880.....	22,465	5,552,965,310	247,183	Average per cent. of increase from 1879 to 1888, in- clusive, 8.5.
1881.....	23,749	6,543,127,968	279,722	
1882.....	25,442	6,284,000,742	243,062	
1883.....	27,415	7,379,327,788	269,170	
1884.....	29,424	8,510,614,140	289,260	
1885.....	30,593	9,970,829,530	326,886	
1886.....	31,946	10,376,571,254	331,070	
1887.....	34,486	13,168,859,808	381,860	
1888.....	36,863	14,380,166,670	390,098	
1889.....	39,158	12,875,334,453	328,880	<i>Commenced Meter- ing.</i>
1890.....	41,467	12,120,944,532	292,300	
1891.....	43,953	12,057,261,236	274,470	
1892.....	46,400	12,276,612,482	264,582	
1893.....	49,817	13,877,977,208	278,579	

FORTY-SECOND ANNUAL REPORT OF THE

It will be seen that the average per family has increased to a little more than that of 1891, and for the reasons given previously. Although there seems to be a falling off in the good results obtained so far, yet when we consider that the total quantity pumped is still considerably less than that of 1888, notwithstanding that 13,000 families, or a population of 66,500, have been supplied in excess of that of 1888, it will be seen that the results achieved are still enormous.

The following table, showing the amount of water it is reasonable to estimate would have been pumped, upon the basis of information gained from the table preceding, and also showing the quantity actually pumped, will give the actual amount saved.

YEARS.	Families Supplied.	Would have Pumped.	Actually Pumped.	Saved.
1889.....	39,158	16,578,858,448	12,875,334,453	
1890.....	41,467	19,042,973,344	12,120,944,532	
1891.....	43,933	21,690,320,178	12,057,261,236	
1892.....	46,400	25,084,675,200	12,276,612,482	
1893.....	49,817	29,221,157,690	13,877,977,208	
In 5 Years.....		111,812,984,860	63,208,129,911	48,604,854,949

The above results are arrived at by taking the average increase for ten years previous to 1880, which was 8.5 per cent, and assuming that the quantity pumped would have increased each year in the same ratio. Looking back over the column, in first table presented, marked "total quantity," the assumption, or estimated quantity that would have been pumped, is justified.

FINANCIAL SAVING EFFECTED.

In my last annual report, I entered very exhaustively into a mathematical calculation of the amount saved to the Board during the years 1889, 1890, 1891 and 1892, by the introduction of meters. The actual amount saved up to January 1st, 1893, was \$235,408.35. As shown by the foregoing table, the

amount saved during the past year is greater than the average of the four years previous, notwithstanding the fact that the pro rata per family has been increased.

For the details of the operation of this department, I would respectfully refer you to the report of Supt. Putnam.

PUMPING WORKS.

The construction at the Pumping Works, above referred to, is very near completion. The use of crude oil as a fuel has been, if anything, more satisfactory than was estimated. For cleanliness and the ease with which it is handled and used, it has no equal; and when it is considered that its cost to the Board for the year 1893 was about \$27,000, with a saving in labor of \$2,280, and that the cost of fuel in 1888 was about \$39,000, with this additional cost of labor, the financial saving by its use can be fully appreciated.

The amount expended at the works since its original establishment, including that expended on the grounds and chargeable to the Hurlbut Fund, is shown in the following table:

ITEMS.	Previously Expended.	1893.	Total.
Land	\$35,000 00	.....	\$35,000 00
Force Mains	609,414 77	\$12,552 92	621,967 69
Inlet Pipes	90,626 84	.....	90,626 84
Dock, Basin and Canal	135,309 12	.....	135,309 12
Conduits and Wells	73,710 52	3,960 00	77,670 52
Engine, Boiler and Coal Houses	164,183 14	24,974 98	189,107 12
Stand Pipe and Tower	30,420 72	.....	30,420 72
Pump Wells	54,221 56	.....	54,221 56
Engines	265,642 24	56,018 32	321,655 56
Boilers	44,248 40	10,000 00	54,248 40
Engineer's House	7,773 14	366 61	8,139 75
Sewer	3,666 25	.....	3,666 25
Grounds, Fences and Gate- way	54,632 32	22,890 12	77,522 44
Inspection	2,977 86	.....	2,977 86
Miscellaneous	9,850 72	1,844 08	11,694 80
Total	\$1,581,626 60	\$132,602 08	\$1,714,228 68

EFFECT OF WATER IN SEWERS.

Superintendent Putnam in his report speaks of the fact, that during the last year his examiners reported that in answer to their notice that water must not be allowed to run continually, they often received the information that this was done at the direction of the Board of Health.

He made some inquiries in regard thereto and found that the inspectors under the said Board were so instructing the people, saying it was to be done for the purpose of keeping the sewers clean.

It seems from the above that it is not only *not generally* understood, but very *seldom* understood, even by those whose education would indicate a knowledge of such things, that running streams in sewers have no effect whatever in dislodging and removing the depositions therein. The liquid matter in sewers is easily disposed of, in fact will care for itself, but the solid and greasy matter deposited therein cannot be disturbed unless it be by force such as is exercised by a "flush" or a sudden dump of water that will fill the sewer and rush impetuously towards an outlet.

As an illustration, last February an application was received to permit an attachment of a pipe placed in the Campbell avenue sewer where there was a considerable accumulation of solid matter in the bottom of the sewer. It was arranged so that at frequent intervals jets of water would be discharged downwards and would by mere force dislodge and break up this accumulation.

The permission was given, and a man sent to observe the conditions and measure the quantity of water consumed. One fact was startlingly corroborative of the opinion that flowing water in sewers accomplishes no good whatever towards removing solid matter deposited therein. In this sewer was found a flowing stream of over 12 inches in depth, which, instead of disturbing the solid matter beneath, was gradually yet surely increasing it by depositing matter carried along with it.

Witness the action going on continually in our water mains themselves, wherein the water occupies all the space and with a pressure in every direction of from 20 to 40 pounds to a square inch. If flowing streams can accomplish anything, they certainly ought under such conditions, and yet the fact is that there is gradually being deposited in the bottom of these pipes, from the water itself, solid matter that can only be removed by opening and closing gates in such manner as to send the water "skurrying" in the opposite direction from its usual course.

It is often complained that the use of meters, by causing an economical use of water, restricting its quantity and flow in sewers and preventing thereby a removal of the accretions therein, is directly responsible for the prevalence of diphtheria and other kindred diseases. On the contrary meters are a benefit in this direction, as they often influence the adoption and use of the tank closet as a matter of economy, which, discharging a few gallons of water at once, accomplishes more in cleaning out the waste pipe all the way to its entrance into the sewer than a running stream would accomplish in a week. The force of even such a small body of water rushing in one solid bulk through the confined area of a waste pipe will move everything before it.

At my request, Mr. Williams about the first of last October made some very interesting computations in regard to this question. He says that the best authorities agree that the velocity of flow in a sewer should be between two and three feet per second; that, assuming that our sewers are constructed correctly, the capacity of the several main sewers is 975,000 gallons per minute; and that the maximum capacity of the engines at the pumping works is only 5,400 gallons per minute, or one-eighteenth that of the sewers.

It will be seen from this that if the entire water supply were turned into the sewers that it would simply afford them running streams at their bottoms, that would accomplish nothing.

Another point he calls attention to is the fact that when

the traps are partially open to permit the flow of water, an opportunity is offered for the passage of foul gases into the building. An experience of this nature happened in New York city in one of the hospitals. The same instructions were given there by the Board of Health as here, and the presence of foul gases was soon apparent which, after an investigation, was found to be coming through the partially open traps from the sewer. Of course the orders to "let the water run for the purpose of cleaning the sewers," were immediately rescinded.

Mr. Williams also gave some interesting data in regard to rain-falls. The area of surface drained by the sewers of Detroit is about 30 square miles. Experiments show that about 20 per cent. of the rain-fall reaches the sewers.

In the 940 minute storm of October 3d there fell 1,050,274 gallons of water, 20 per cent. of which passed into the sewers, or 210,055 gallons each minute, a quantity equal to *four* times the maximum capacity of our works.

In fact, we owe to our rain storms the cleanly condition of our sewers, and if it is found that in certain sewers, as I presume it may be, that rains do not accomplish this desired result, then some way must be adopted of flushing the sewers, something after the manner and upon the same principle as a tank closet. Running streams will not produce any such effect.

The "fooling" with fuel at the pumping works, as a correspondent with one of the daily papers designated it, "going from coal to gas, from gas to coal, to gas again and then to oil," has had the following pecuniary effect:

YEARS.	FUEL, LABOR, LUBRICANTS, &c.	PER MILLION.
1888	\$60,384.11	\$4 19
1889	61,560.48	4.78
1890	54,433.49	4.49
1891	53,012.77	4.39
1892	53,287.89	4.27
1893	46,546.01	3.35

The comparison is most favorable between the years 1893 and 1888 and 1889, as the quantity pumped during the year 1893 was about one thousand millions more than that of 1889 and about five hundred million less than that of 1888.

WATER WORKS BONDS.

The following table shows the whole history of the bonded indebtedness of the Board, in which will be seen that the total amount of bonds issued is \$1,850,000, of which \$692,000 have already been redeemed, leaving outstanding \$1,158,000, upon which there is an annual interest of \$70,820.

NO. OF ISSUE.	ACT OF	ISSUED.	PAYABLE.	AMOUNT.	RATE OF IN- TEREST.	REDEEMED.	OUT- STANDING.
1st	1853	Aug. 1, 1853	Aug. 1, 1853	\$100,000	7cts.	\$100,000	.....
"	"	" "	Aug. 1, 1878	100,000	7 "	100,000	.....
"	"	" "	Aug. 1, 1873	50,000	7 "	50,000	.....
2nd	1855	Aug. 1, 1855	Aug. 1, 1860	100,000	7 "	100,000	.....
"	"	June 12, 1855	Aug. 1, 1885	100,000	7 "	100,000	.....
"	"	" "	Aug. 1, 1880	50,000	7 "	50,000	.....
2nd	1857	Aug. 1, 1858	Aug. 1, 1898	150,000	7 "	75,000	\$75,000*
"	"	Aug. 1, 1867	Aug. 1, 1887	100,000	7 "	100,000	.....
4th	1869	Feb. 1, 1870	Feb. 1, 1900	100,000	7 "	.....	100,000
5th	"	Aug. 1, 1873	Aug. 1, 1902	50,000	7 "	.....	50,000
6th	"	Aug. 1, 1873	Aug. 1, 1903	50,000	7 "	.....	50,000
"	1873	Feb. 1, 1874	Feb. 1, 1904	50,000	7 "	9,000	41,000
7th	1869	Aug. 1, 1874	Aug. 1, 1904	50,000	7 "	6,000	44,000
"	1873	" "	" "	200,000	7 "	.....	200,000
"	"	June 1, 1875	June 1, 1905	150,000	7 "	1,000	149,000
"	"	June 1, 1876	June 1, 1906	200,000	6 "	1,000	199,000
"	"	Sept. 1, 1880	Sept. 1, 1899	100,000	4 "	.....	100,000
"	"	April 1, 1881	April 1, 1897	100,000	4 "	.....	100,000
"	"	Dec. 1, 1881	Dec. 1, 1896	50,000	4 "	.....	50,000
				\$1,850,000		\$692,000	\$1,158,000

* Running one year at 6 per cent.

As stated one year ago, on the first of last August \$146,000 of bonds, as shown above, became due and payable. In order to meet this demand it was necessary for the Board to negotiate a loan of \$75,000, which was done, and that amount of the bonds falling due were practically reissued for one year at 6 per cent. interest.

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"	1873	Feb. 1, 1874	Feb. 1, 1904	50,000	7 "	9,000	41,000
7th	1869	Aug. 1, 1874	Aug. 1, 1904	50,000	7 "	6,000	44,000
"	1873	"	"	200,000	7 "	200,000
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"	"	April 1, 1881	April 1, 1897	100,000	4 "	100,000
"	"	Dec. 1, 1881	Dec. 1, 1896	50,000	4 "	50,000
				\$1,850,000		\$692,000	\$1,158,000

* Running one year at 6 per cent.

As stated one year ago, on the first of last August \$146,000 of bonds, as shown above, became due and payable. In order to meet this demand it was necessary for the Board to negotiate a loan of \$75,000, which was done, and that amount of the bonds falling due were practically reissued for one year at 6 per cent. interest.

The following table shows many details connected with the works and its operations that are of considerable interest. These details and conditions are given of the six preceding years, in order to show what has been done in the past five years by the measures adopted by the Board to prevent the waste of water.

Attention is called particularly to the last two lines of this exhibit, and a comparison invited between the years 1888 and 1893. Over \$1,700 less of "actual operating expenses" and an increase in the population of 62,803, or $32\frac{1}{2}$ per cent.

As will be seen by the table the per capita daily supply has increased from 140 to 148, and is explained on page 14.

The entire expense for pumping water during the year was \$46,546.01, or \$14,000 less than 1888 and \$15,000 less than 1889.

COMPARATIVE STATEMENT.

	1888.	1889.	1890.	1891.	1892.	1894.
Daily average consumption in gallons.....	30,307,716	35,374,888	33,303,087	33,033,592	33,634,554	33,031,853
Daily average consumption per capita	304	173	155	144	140	148
Total consumption in the year.....	14,830,166,670	12,876,384,453	12,120,914,538	12,037,361,326	12,376,612,438	12,877,977,308
Consumption through meters, gallons.....	91,750,000	139,090,000	636,344,765	1,194,849,400	1,539,835,300	1,771,834,500
Percentage of water metered ..	.003	.01	.06½	.10	.13	.136
Revenue from unmetered water.....	\$335,140.00	\$354,016.00	\$350,599.73	\$343,335.89	\$340,949.35	\$345,454.96
Revenue from metered water.....	\$9,175.00	\$13,909.00	\$37,373.00	\$46,634.08	\$61,533.03	\$73,083.37
Per one thousand gallons metered water.....	.10	.10	.069	.088	.083	.04
Per one thousand gallons unmetered water.....	.033	.027	.03	.031	.034	.039
Number of families supplied.....	36,893	39,153	41,437	43,393	46,400	49,817
Number of service connections.....	31,891	37,735	40,351	43,737	47,331	48,657
Miles of pipe.....	335	343	333	405	433	453
Number of meters.....	48	304	506	1,339	2,053	2,568
Expenditures for maintenance.....	\$101,019.00	\$102,557.00	\$102,361.00	\$95,531.54	\$90,561.53	\$97,345.05
Actual operating expense.....	\$33,733.50	\$36,331.00	\$35,746.35	\$38,036.63	\$31,534.53	\$33,031.40
*Estimated population.....	194,247	205,593	215,303	230,051	240,563	257,030

* Obtained by multiplying number of families by 5.12.

The following table is the report of the assessments made in May and June, to commence July 1, 1893.

The assessments were increased \$16,776, notwithstanding there were taken from the assessment rolls and metered, and thereafter appear upon the meter books places, the aggregate assessments upon which amounted to \$10,043, making the actual increase the sum of the two, or \$26,819.

The number of families in the city not supplied are continually decreasing, amounting now to 388. The total number of families in the city is 50,205.

ASSESSMENT 1893-94.

Dist.	WARDS.	FAMILIES.			Vacant Tenements.	Increase Supplied.	ASSESSMENT.		
		Supplied.	Not Supplied.	Whole Number.			1893-94.	Increase or Decrease.	Reduced by use of meters.
1	Ninth.....	5,190	15	5,205	34	607	\$39,783	+ \$2,643	\$494
	Fifteenth...	2,438	53	2,493	19	533	15,502	+ 3,003	333
	Totals ...	7,628	70	7,698	53	1,130	45,285	+ 5,646	706
2	Eleventh ...	3,446	4	3,450	66	279	21,750	+ 2,134	346
	Thirteenth..	2,355	5	2,360	66	243	14,799	+ 1,771	343
	Totals ...	5,801	9	5,810	132	522	36,549	+ 3,905	489
3	First.....	2,432	9	2,491	123	41	28,432	- 1,394	2,036
	Seventh	3,295	20	3,315	71	255	30,791	+ 862	611
	Totals...	5,777	29	5,806	194	296	49,223	- 432	2,647
4	Third.....	3,371	14	3,385	70	126	21,695	+ 614	391
	Fifth.....	3,631	8	3,639	41	53	23,732	+ 719	49
	Totals ...	6,992	22	6,914	111	179	44,477	+ 1,333	440
5	Second	2,010	11	2,021	122	4	27,306	- 1,606	2,199
	Sixth.....	3,892	5	3,897	123	+ 37	25,374	- 106	1,364
	Totals ...	5,402	16	5,418	245	33	52,680	- 1,712	3,463
6	Tenth.....	4,048	9	4,057	68	165	25,498	+ 1,000	533
	Fourteenth.	2,189	41	2,230	43	177	13,197	+ 975	144
	Totals ...	6,237	50	6,287	116	342	38,695	+ 1,975	736
7	Fourth.....	3,253	4	3,256	70	339	23,632	+ 1,350	923
	Twelfth	3,144	6	3,150	45	189	18,324	+ 1,004	329
	Totals ...	6,396	10	6,406	115	528	47,506	+ 2,354	1,252
8	Eighth.....	3,161	1	3,162	52	37	23,056	+ 1,449	300
	Sixteenth...	2,533	181	2,704	34	360	15,167	+ 2,258	.....
	Totals ...	5,694	182	5,866	76	397	38,223	+ 3,707	300
	Aggregate	49,817	388	50,205	1,042	3,417	352,470	+ 16,776	10,043

FINANCIAL STATEMENT.

The following is a complete statement of the financial transactions of the Board during the year 1893:

RECEIPTS.

WATER RATES ACCOUNT—	
Rates paid.	\$490,490 83
PERCENTAGE ACCOUNT—	
From delinquents.....	6,808 76
Penalties for shutting off.....	443 59
SERVICE COCKS ACCOUNT—	
Labor and material.....	6,615 65
CITY OF DETROIT ACCOUNT—	
Tax levy.....	69,167 77
REPAIRING LEAKS ACCOUNT—	
Labor.....	33 50
REAL ESTATE ACCOUNT—	
Rentals.....	2,316 67
IRON PIPE ACCOUNT—	
Labor and materials.....	7,463 97
Bonus paid for extensions.....	1,574 95
HURLBUT FUND ACCOUNT—	
Payment from trustees.....	2,400 00
INTEREST ACCOUNT—	
On deposits general account.....	5,077 81
On deposits sinking fund.....	1,806 97
PLUMBERS' LICENSE ACCOUNT—	
Paid for licenses.....	635 00
PUMPING WORKS ACCOUNT—	
Sale of old material.....	78 00
METERS ACCOUNT—	
Sale of material.....	31 54
PUMPING WATER ACCOUNT—	
For water by farmers.....	4 50
Total receipts.....	<u>\$594,984 43</u>

EXPENDITURES.**FOR CONSTRUCTION.****IRON PIPE ACCOUNT—**

Superintendent and clerks.....	\$7,529 48
Labor.....	88,742 05
Iron pipe.....	97,055 97
Special castings.....	18,795 29
Tools and repairing of.....	1,562 52
Hauling.....	2,672 96
Lumber.....	1,234 12
Coal.....	274 97
Oil.....	49 70
Packing.....	495 46
Lead.....	4,577 46
Plugs.....	151 78
Repairs and materials for.....	86 77
Repaving.....	6,480 81
Street car and toll tickets.....	151 00
Livery.....	69 00
Wagon and harness supplies and repairs...	227 25
Feed.....	868 87
Farrier.....	102 00
Materials—lead pipe, solder, nails, etc....	864 50
Stationery, books, etc.....	74 00
Civil Engineer's salary.....	1,852 60
Materials for iron pipe engineering.....	105 78
Pressure pump.....	399 85
Engine.....	100 00
Brick.....	21 00
Boring machine.....	76 60
Switching charges for 1892.....	485 00
Scales.....	39 90
Refilling Brush street line.....	463 68
Hospital and medical attendance.....	12 00
Freight and express.....	36 96
Gate wells.....	9,946 07
Stop cocks.....	7,209 88
Suction machine.....	66 25
	<hr/>
	\$247,760 48

PUMPING WORKS ACCOUNT—

Labor.....	\$4,181 88
Pipe and hauling.....	8,095 04
Fixtures in engineer's house.....	75 00

Work in and on engineer's house.....	\$366 61	
Special castings, fittings, etc.....	7,099 76	
Repairs on engine and boiler houses and tower.....	8,609 89	
Damages.....	328 74	
Materials, lumber, etc.....	563 14	
Engine, boilers and foundations.....	66,013 33	
Cut stone work.....	4,212 00	
Mason work.....	4,918 35	
Carpenter work.....	800 41	
Iron work.....	1,900 00	
Slating and roof work.....	2,000 00	
Painting.....	2,014 70	
Waste gate.....	60 00	
Conduit to new engine.....	3,980 00	
Architect.....	519 63	
		\$110,567 47
OIL PLANT ACCOUNT—		
Fittings for boilers.....	\$34 99	
		34 99
METER ACCOUNT—		
Superintendent and labor.....	\$8,845 48	
Meters.....	6,967 43	
Freight and express.....	41 04	
Specials and fittings.....	796 49	
Horse board and shoeing.....	184 50	
Repairs to harness and vehicles.....	15 80	
Street car tickets.....	20 00	
Hauling.....	108 25	
Materials—lumber, solder, etc.....	658 34	
Tools and repairing of.....	108 60	
Superintendent's expenses east.....	185 00	
Postage.....	83	
Printing, stationery and stamps.....	20 25	
Meter wells.....	46 10	
Meter repairs.....	9 75	
		17,967 88
REAL ESTATE ACCOUNT—		
Insurance.....	\$384 54	
Plumbing.....	26 66	
Repairs to buildings.....	68 40	
		379 60
ENGINEERING ACCOUNT—		
Materials and instruments.....	\$361 48	
		361 48

BOARD OF WATER COMMISSIONERS.

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HORSE AND WAGON ACCOUNT—

Horses.....	\$387 50	
Harness.....	25 00	
Vehicles and parts thereof.....	142 70	
		\$555 20

OFFICE FURNITURE AND FIXTURES ACCOUNT—

Furniture and fixtures....	\$411 91	
		411 91
Aggregate.....		<u>\$378,048 94</u>

OPERATION AND MAINTENANCE.

OFFICE ACCOUNT—

Secretary, assessors and clerks.....	\$19,218 49	
Watchmen and janitors.....	1,463 65	
Printing and binding.....	1,259 00	
Advertisements and subscriptions.....	127 26	
Supplies—soap, matches, etc.....	237 28	
Stationery.....	865 96	
Extra services.....	658 95	
Expert examiners.....	5,315 28	
Fuel.....	675 06	
Light.....	271 64	
Postage and telegrams.....	171 17	
Attorney.....	450 00	
Memorial tribute.....	25 25	
Germicide.....	18 00	
Sprinkling.....	84 80	
Ice.....	29 25	
Street car tickets.....	43 00	
Horse board.....	165 00	
Farrier.....	24 50	
Harness and buggy repairs....	44 50	
House and furniture repairs.....	41 82	
Medical attendance.....	4 00	
Safe deposit rental.....	10 00	
Livery.....	5 00	
Counterfeit money.....	7 00	
Telegraphing.....	16 77	
Telephone service.....	470 41	
		\$31,051 49

PUMPING WATER ACCOUNT—

Engineers and firemen.....	\$16,571 59
Consulting engineer.....	1,200 00

Fuel oil.....	\$29,892 88	
Coal.....	72 05	
Printing, telegraphing and stationery...	24 15	
Supplies—rags, waste, soap, etc.....	288 18	
Supplies—valves, gaskets, etc.....	290 99	
Boiler and machine repairs.....	135 71	
Lubricants.....	251 43	
Tools and repairing of.....	115 45	
Medical attendance (injuries in 1892).....	20 50	
Horse, harness, etc.....	57 55	
Feed, shoeing, etc.....	62 50	
Street car tickets.....	15 00	
Electric light, royalty and attachments....	55 18	
		\$48,463 46
WATER RATES ACCOUNT—		
Overcharge returned.....	\$15 00	
		15 00
PERCENTAGE ACCOUNT—		
Labor.....	\$1,847 50	
		1,847 50
REPAIRING LEAKS ACCOUNT.		
Labor.....	\$3,548 99	
Wagon and harness repairs.....	128 85	
Feed and stabling.....	218 87	
Blankets.....	16 00	
Farrier.....	64 25	
Street car and toll tickets.....	100 00	
Repairing of tools.....	76 06	
Tools and materials.....	268 59	
Repairing pavement.....	21 44	
		9,442 06
SERVICE CONNECTIONS ACCOUNT—		
Labor and inspectors.....	\$5,764 47	
Cart and harness repairs, blankets, etc....	265 20	
Service cocks and valves.....	2,599 47	
Farrier.....	67 75	
Lap robes.....	37 00	
Tools and materials.....	459 01	
Feed.....	90 23	
Toll tickets.....	5 00	
		10,378 83
INSPECTION ACCOUNT—		
Labor.....	\$3,240 00	
		3,240 00
Aggregate.....		\$104,339 33

BONDED INDEBTEDNESS ACCOUNT.

Bonds paid.....	\$71,000 00
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INTEREST ACCOUNT.

Interest paid.....	\$74,168 69
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PARK AND BOULEVARD COMMISSION.

Laying submerged pipe across river to island.....	\$8,886 22
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HURLBUT FUND ACCOUNT.

Superintendent, librarian and labor.....	\$3,899 51
Plants, trees, flowers, fertilizers, etc.....	411 45
Tools and materials.....	84 03
Materials for greenhouse.....	248 09
Horse, feed, etc.....	186 25
Gravel.....	372 40
Sewer pipe.....	47 71
Fence.....	5,969 10
Sidewalk.....	792 00
Memorial gateway (part).....	8,900 00
Architect.....	1,142 03
	<u>\$22,049 56</u>

RECAPITULATION.

Construction expenditures.....	\$378,048 94
Operation and maintenance expenditures.....	104,339 38
Bonded indebtedness.....	71,000 00
Interest.....	74,168 69
Park and Boulevard Commission.....	8,886 22
Hurlbut fund.....	22,049 56
Aggregate.....	<u>\$658,487 74</u>

RECEIPTS OF WATER RATES BY DISTRICTS.

YEAR.	1st District, WARD 9 AND 12.	2d District, WARD 11 AND 13.	3d District, WARD 1 AND 7.	4th District, WARD 8 AND 5.	5th District, WARD 2 AND 6.	6th District, WARD 10 AND 14.	7th District, WARD 4 AND 12.	8th District, WARD 6 AND 10.	METERS.	Amount.
1882-3	.....	.....	\$7 00	.....	.....	.....	.....	.....	.....	\$7 00
1883-4	.....	.....	7 00	.....	.....	.....	.....	.....	.....	7 00
1884-5	.....	.....	7 00	.....	\$7 00	.....	.....	.....	.....	14 00
1885-6	.....	.....	7 00	.....	7 00	.....	.....	.....	.....	14 00
1886-7	.....	.....	5 00	.....	7 00	.....	.....	.....	.....	12 00
1887-8	.....	.....	5 00	.....	23 00	.....	.....	.....	.....	28 00
1888-9	.....	.....	5 00	\$5 00	7 00	.....	\$159 98	.....	.....	176 98
1889-90	.....	.....	13 00	146 90	9 75	.....	74 85	.....	.....	244 50
1890-1	.....	.....	5 00	239 80	34 00	\$6 00	91 35	.....	.....	376 05
1891-2	.....	\$3 50	37 25	121 13	60 25	39 25	38 00	\$69 50	.....	367 88
1892-3	\$19,950 81	16,965 76	23,563 87	31,431 39	25,735 87	15,716 46	22,560 94	18,481 43	\$34,969 53	203,404 07
1893-4	24,061 69	18,197 92	24,963 03	32,339 63	27,412 07	19,493 51	23,889 25	19,566 93	37,046 84	216,889 85
Total...	\$44,033 00	\$35,186 20	\$48,623 65	\$44,183 84	\$53,393 94	\$38,345 23	\$46,764 27	\$38,137 84	\$72,035 87	\$420,490 83

To the Board of Water Commissioners:

GENTLEMEN—In accordance with the regulations of the Board we have employed J. H. Clegg, expert accountant, to make a thorough examination of the financial operations of the employees of the Board, both in the receiving and paying out of money, from the date of the last investigation up to January 1, 1894, and append herewith his report.

Yours respectfully,

(Signed) H. M. DUFFIELD,

J. L. HUDSON,

Committee on Ways and Means.

DETROIT, MICH., January 31, 1894.

*To the Committee on Ways and Means, Board of Water Commissioners,
City of Detroit:*

GENTLEMEN—As instructed by your committee, I have examined the books and vouchers of the Water Works for the remainder of the year ending December 30, 1893. My report of September 5, 1893, covered the examination of the Secretary, Receiving Clerk, and Permit Clerk to May 1, 1893, the Meter Department to January 1, 1893, and the Assessors and Collectors to July 1st, 1893.

The examination just concluded covers all the officials above named from the respective dates, excepting the Assessors and Collectors.

I did not go into the details of the Assessors' and Collectors' accounts, for the reason that I consider the system of checks now in use to be a sufficient protection until the end of the assessment year (June 30, 1894), when their work can be proven. I did, however, inspect each stub book, and saw that each and all were properly certified as being correctly footed and posted by officials of other districts or departments.

I carefully examined the accounts of the Secretary, and found properly approved vouchers for all disbursements, and said disbursements were correctly charged to the various accounts.

The Receiving Clerk has accounted for all moneys paid to him, and his cash and bank balances as shown I verified and found correct.

The accounts of the Meter and Permit Clerks are also correct.

CASH STATEMENT.

Jan. 1, 1893, cash on hand.....	\$4,106 68	
Commercial National Bank, General Fund	119,249 24	
Commercial National Bank, Sinking Fund	48,896 15	
Cash receipts, 1893.....	524,934 43	
		<u>\$697,186 44</u>
Disbursements, 1893.....	\$658,487 74	
Jan. 1, 1894, cash on hand.....	4,748 48	
Commercial National Bank, balance,	33,450 23	
Secretary's Fund.....	500 00	
		<u>\$697,186 44</u>

Respectfully submitted.

(Signed) JOHN H. CLEGG,

Accountant.

The actual operating and maintenance expenses for the year were \$97,246.68, and is arrived at as follows:

Office.....	\$31,051 49	
Pumping water	48,463 46	
Water rates.....	15 00	
Percentage.....	\$1,847 50	
By fines collected.....	443 50	
		<u>1,404 00</u>
Repairing leaks.....	\$9,443 05	
By labor paid	33 50	
		<u>9,400 55</u>
Service cocks.....	\$10,378 83	
By labor and material paid for.....	6,615 65	
		<u>3,653 18</u>
Inspection.....	3,240 00	
		<u>\$97,246 68</u>

The above figures are taken also for the actual operating expenses, less the sum expended in the employment of expert accountants during the past year, and which practically had nothing to do with the operation or running of the works. This sum was \$5,215.28, leaving the operation expense \$92,031.40.

Attached herewith is an inventory of all the properties of the Board.

Some interesting facts may be deduced therefrom, as follows:

The entire expense for construction up to Jan. 1, 1894, is..	\$5,569,681 68
The present indebtedness.....	1,158,000 00
Paid for.....	\$4,411,681 68
The present valuation of the works, as per inventory, is...	4,601,849 50
Showing a depreciation of.....	968,282 18

All of which is respectfully submitted.

L. N. CASE,
General Superintendent.

VALUATION OF THE WORKS.

AGGREGATES.

Real estate.....	\$412,427 29
Oil plant.....	14,649 29
Buildings, docks, basins, conduits, force mains at pumping works.....	853,602 69
Water pipe laid and in use.....	3,162,077 52
Meters placed and in use.....	77,571 87

TOOLS AND MATERIALS ON HAND.

Office furniture and fixtures.....	7,758 90
In repair department.....	1,292 81
In meter department....	1,827 59
In service cocks department.....	1,554 75
In iron pipe department.....	39,787 05
In pumping water and works department.....	24,582 06
In Hurlbut Fund department.....	617 78
Horses, vehicles and harness.....	3,600 00
Aggregate.....	<u>\$4,601,849 55</u>

The above valuation consists in detail as follows:

REAL ESTATE.

Office building and lot.....	\$60,000 00
Orleans street lots.....	33,750 00
Storage grounds and improvements.....	47,209 00
Pumping works grounds and improvements ...	271,477 29
	<u>\$412,427 29</u>

OIL PLANT.

Pumping station house, engines and pipes, tanks and fixtures at works.....	\$14,649 29
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PUMPING WORKS.

Buildings, dock, basin, conduits, pipe, etc.....	\$853,602 69
Tools.....	1,011 83
Materials: Rope, waste, etc.....	500 29
" Gauges, valves, etc.....	814 80
" Iron, lead, etc.....	720 25
Furniture.....	356 00
Wood and coal.....	14,879 10
Fuel oil (145,056 gals.).....	2,226 87
Holisting engines, pony pumps and boilers, electric light plant and stock, gas machine, etc..	4,073 92
Tools and materials—Huribut Fund.....	617 73
	\$878,603 48

OFFICE BUILDING.

Counter	in office.....	\$1,000 00
Fourteen office tables	" "	215 00
Six book cases	" "	660 00
Three wardrobes	" "	835 00
Seven desks	" "	200 00
Thirty-six chairs	" "	91 50
Thirteen office stools	" "	45 00
Eight city maps	" "	20 00
One marble clock	" "	100 00
Four atlas maps	" "	100 00
Partitions and railings	" "	800 00
Heating apparatus	" "	1,400 00
Electric light fixtures	" "	55 00
Miscellaneous properties	" "	100 00
Furniture in board room.....		575 00
4 Stools,	in drafting room....	12 00
4 Drafting tables,	" " "	50 00
3 " " and horses,	" " "	26 00
3 " boards,	" " "	2 00
1 Blue print outfit,	" " "	25 74
1 Case instruments,	" " "	60 00
2½ Rolls blue print paper,	" " "	18 70
6 Rolls velum,	" " "	46 20
5 Tee squares,	" " "	6 25

2 Straight edges,	in drafting room.....	\$2 00
2 Tape lines,	" " "	2 25
1 Roll drawing paper,	" " "	5 00
2 Readers,	" " "	2 85
1 Desk and chair and stool,	Engineer's room....	40 25
1 Table,	" "	27 00
1 Drafting table,	" "	15 00
5 Chairs,	" "	15 00
1 Washstand,	" "	26 66
3 Desks,	Supt. of Ex. room,	40 00
2 Tables,	" "	5 00
2 Pigeon hole cases,	" "	3 00
1 Case for maps and drawings,	" "	1,500 00
1 Copy press books and stand,	" "	10 00
1 Safe, hat rack, 8 chairs,	" "	86 50
1 Case for filing reports, etc.,	" "	25 00
3 Galv. boxes and 6 tin boxes,	" "	3 50
Mucilage, ink, etc., and wells,	" "	7 50
Blanks, stationery, etc.,	" "	50 00

\$7,758 90

REPAIR DEPARTMENT.

1 set caulking tools.....	\$1 50
150 lbs. pig lead.....	6 00
63 lbs. sheet lead.....	3 81
180 lbs. 1½ in. lead pipe.....	9 00
43 lbs. 1 in. lead pipe.....	2 15
118 lbs. ¾ in. lead pipe.....	5 90
11 ladles.....	16 50
2 fire pots.....	12 00
1 dozen diamond pointed chisels.....	12 00
5 flat chisels.....	2 50
1 anvil.....	2 50
2 vises.....	8 00
19 gate keys.....	26 25
15 street keys.....	15 00
3 pumps.....	120 00
5 pressure gauges.....	12 00
11 hydrant wrenches.....	5 50
10 dippers.....	5 00
12 pairs rubber boots.....	48 00
3 leather coats.....	9 00

5 shovels.....	\$3 75
3 picks.....	4 50
5 pounders.....	5 00
5 pounder handles.....	1 00
18 lanterns.....	6 50
2 saws.....	1 25
1 draw knife.....	50
1 log rimmer.....	1 75
1 stop box.....	1 25
1 platform scale.....	25 00
2 force pumps.....	8 00
1 grindstone.....	1 25
3 water pails.....	50
70 feet $\frac{1}{2}$ in. hose.....	7 00
3 pick handles.....	24
2 sledges.....	2 40
1 8 in. bolted sleeve, 150 lbs. at $2\frac{1}{8}$ cts.....	3 15
1 6 in. " 96 " ".....	2 02
10 4 in. " 537 " ".....	11 28
8 4 in. " 160 " ".....	8 26
8 8 in. " 39 " ".....	83
2 8 in. sleeves, 65 lbs. at $2\frac{1}{8}$ cts.....	1 37
1 6 in. " 71 " ".....	1 50
1 8 in. " 84 " ".....	1 78
1 4 in. " 53 " ".....	1 11
1 4 in. bend, 55 " ".....	1 16
1 8 in. " 43 " ".....	90
6 4 in. gate stems (O'Brien's).....	7 50
6 6 in. " ".....	10 50
6 4 in. " (Murdock).....	10 50
5 6 in. " ".....	12 00
5 4 in. " (Flowers).....	15 00
5 6 in. " ".....	20 00
1 8 in. valve and nut.....	14 45
1 4 in. valve and top (Flowers).....	7 70
1 6 in. " " (Murdock).....	10 45
1 6 in. " " (Flowers).....	10 45
1 4 in. " " (Murdock).....	7 70
1 6 in. valve and nut (O'Brien).....	8 85
4 6 in. stuffing boxes (Murdock).....	65
2 4 in. " " ".....	90
4 4 in. " " (O'Brien).....	1 80
6 6 in. " " ".....	4 50

BOARD OF WATER COMMISSIONERS.

37

36 in. caps, 77 lbs. at $2\frac{1}{10}$ cts.	\$1 62
13 in. cap, 19 " "	40
14 in. cap, 30 " "	63
2 prong keys	2 50
3 crow bars.	3 80
1 machine for raising gate boxes.	7 50
18 red lantern globes.	9 00
2 white lantern globes.	20
4 axe handles.	40
15 lbs. solder	1 88

\$1,392 81

SERVICE COCKS.

1 2x4 Smith sleeve and valve.	\$9 00
1 3x4 " " " "	10 00
1 2x6 " " " "	11 50
1 3x6 " " " "	12 50
1 4x6 " " " "	16 00
1 2x8 " " " "	12 00
1 3x8 " " " "	14 00
1 4x8 " " " "	18 00
1 2x10 " " " "	16 00
1 3x10 " " " "	18 00
1 4x10 " " " "	22 00
3 pairs rubber boots. at \$4 00	8 00
2 leather jackets	4 00 8 00
273 1 in. service cocks, at 90c.	245 70
303 $\frac{1}{2}$ in. " " at 45c.	136 35
1 Smith tapping machine.	850 00
3 Mueller " "	at \$85 00 255 00
1 30 in. saddle.	1 00 1 00
2 24 in. "	1 00 2 00
2 16 in. "	1 00 2 00
2 12 in. "	1 00 2 00
3 10 in. "	1 00 3 00
3 8 in. "	1 00 3 00
3 6 in. "	1 00 3 00
3 4 in. "	1 00 3 00
3 3 in. "	1 00 3 00
6 yokes.	1 75 10 50
3 pressure wrenches.	50 1 50
3 handles for turning taps.	2 00 6 00
3 1 in. drills and taps.	3 00 24 00
10 $\frac{1}{2}$ in. " " "	2 00 20 00

2 1/2 in. drills and taps.....	\$2 50	\$7 50
2 1/2 in. taps.....	90	2 70
2 1/2 in. taps and drills....	2 00	4 00
1 emery wheel and spindle.....		8 40
5 oil cans.....	10	80
2 monkey wrenches.....	60	1 20
1 Stillson wrench.....		8 00
8 books and slides.....	3 00	24 00
227 drills (old).....	80	38 10
3 drilling ratchets.....	5 00	15 00
2 horse blankets.....		9 00

\$1,554 75

METERS.

37 meters.....	\$1,161 00
1 foot lathe.....	90 00
1 water motor.....	50 00
Lathe chucks, turning tools, etc.....	18 28
1 stock and dies, ratchet stock, dies and gas taps.....	33 25
4 pipe cutters and wheels.....	43 50
14 Stillson monkey and 8 wrenches.....	18 10
2 sets caulking tools and hammers.....	4 35
1 pair snips.....	2 50
6 pairs pipe and chain tongs.....	12 50
3 vices.....	18 75
1 washer cutter.....	75
5 chisels.....	1 50
2 hollow punches.....	1 50
1 steel bar.....	1 50
6 files.....	1 25
6 gate keys.....	9 50
1 nail puller.....	1 25
1 seal punch and lead seals.....	4 00
2 chain and rope tackle.....	13 00
1 pair boots.....	1 00
3 oil cans.....	1 50
2 testing tanks.....	16 50
4 saws.....	6 00
2 axes and jack plane.....	1 50
1 extension bit and cutter.....	1 70
Saw set, square and auger.....	2 25
4 fire pots and ladles.....	24 75
6 balling dippers.....	6 00
4 hand pumps and valves.....	9 70

8 lanterns (1 electric).....	\$14 35
Blankets, robes and brush.....	10 50
Sun shade for wagon.....	3 00
39 tees.....	2 48
97 nipples.....	9 08
65 bushings.....	2 26
30 reducers.....	1 90
55 couplings.....	3 12
54 unions.....	7 70
204 ells.....	15 16
126 meter couplings.....	31 35
21 valves (check).....	20 23
1 4-in. gate valve.....	5 50
301 lbs. lead pipe.....	13 04
56 lbs. wiping solder and half and half.....	6 80
6 bars tin.....	1 44
31 lbs. brass castings.....	7 75
21 small boxes for meters.....	8 10
Lockers, shelving, benches, etc.....	15 00
Lumber.....	23 00
Flange bolts.....	8 14
Iron covers.....	47 25
Gas pipe, etc.....	17 03
Miscellaneous articles.....	6 03

\$1,827 59

IRON PIPE DEPARTMENT.

PIPE IN GROUND.

103 feet 45 in. pipe.....	\$1,699 50
45,137 " 42 ".....	658,996 40
715 " 36 ".....	6,587 35
49,337 " 30 ".....	322,404 86
84,813 " 24 ".....	408,704 93
461 " 20 ".....	1,751 80
87 " 18 ".....	278 40
36,777 " 16 ".....	110,469 78
8,444 " 12 ".....	16,556 38
114,509 " 10 ".....	174,790 29
219,795 " 8 ".....	250,841 53
917,408 " 6 ".....	649,018 93
831,348 " 4 ".....	526,750 94
76,302 " 3 ".....	37,474 28
2,820 " 2 ".....	752 10

3,383,046 total feet.

3,162,077 52

STOCK AT RESERVOIR.

Iron pipe.....	\$33,957 98	
Specials.....	5,981 16	
Gates and valves.....	1,850 81	
Gate boxes.....	777 48	
Gate well covers.....	648 80	
Lead.....	2,466 05	
Packing.....	67 95	
Oil.....	8 60	
Coal.....	9 72	
Scrap iron.....	1,600 00	
Tools.....	989 74	
Covers and blankets for horses.....	80 00	
Materials, lumber, cement, etc.....	1,456 26	
		<u>\$39,787 05</u>

HORSES AND WAGONS.

1 horse, phaeton, sleigh and harness—Office...	\$305 00	
1 horse, cart, etc., and harness—Pumping Works	125 00	
1 horse, carriage, wagon and harness—Meter..	439 00	
4 horses, 4 wagons and harness—Rep'g Leaks.	763 00	
2 horses, 2 wagons and harness—Service Cocks	464 00	
4 horses, 8 trucks and harness—Iron Pipe.....	1,330 00	
1 horse, 1 cart and harness—Hurlbut Fund....	185 00	
		<u>3,600 00</u>
Aggregate.....		<u>\$4,601,349 55</u>

REPORT OF THE CIVIL ENGINEER.

JANUARY 25, 1894.

To the Honorable Board of Water Commissioners of the City of Detroit:

GENTLEMEN—Conforming to the regulations of your Honorable Body, the Civil Engineer submits for your consideration the following report of the operations under his supervision during the year just past.

The most important subject receiving attention thus far has been the equalization and increase of pressure in our system. Until very recently the works of this city have been operated with a pressure as low as the lowest in any city of the United States. A low pressure is economical as far as the expense of operation is concerned, for the fuel consumed, other things being equal, will vary with the head pumped against, and if there be waste, it will increase as the pressure increases, though not in the same ratio. But the pressure maintained on our system appears to have been too low to satisfy the demands of our population for several years past, and what has been available has been very unfortunately distributed; while the residents in the southwest portion of the city had an abundant supply, those living in the upper Woodward and Cass Avenue district were oftentimes unable to get water into second-story bath-rooms.

Owing to the many complaints of deficient pressure, your Secretary, in July, 1891, through the courtesy of the Fire Commission, had placed in various fire engine houses about the city, pressure gauges, from which readings have been recorded every hour to the present time. For the first month the recorded pressures at the several locations were found to vary from 11.9 pounds, the lowest, to 26.9, the highest, with an average from the entire city, deduced from these

readings, and the areas of the districts which they represent of 18.02 pounds. In September of the same year this last average pressure had fallen to 16.9 pounds. During the colder months, as seen by Plate 3, page 51, it recovered itself somewhat, but in August, 1892, it had fallen to 15.4 pounds, and in January, 1893, to 15 pounds. During the eighteen months intervening between the location of the gauges and this last date, your Secretary had endeavored, by throttling certain lines, to correct the evils, and would doubtless have been successful to a considerable degree, had it not been that the extensions then under construction, were so designed as to counteract any beneficial results that were obtained. As it was, his efforts served to keep the pressure in certain localities from falling to the very unsatisfactory point it must otherwise have reached.

The Civil Engineer's connection with these works dates from the middle of last February, and at that time the study of this problem was turned over to him. Pressure readings were at once taken at ninety-seven points about the system, which are recorded in the table on page 61. A study of the topography of the city revealed that within the limits supplied by the system there is a difference of elevation of more than fifty feet, which amounts to a difference of pressure of about twenty-two pounds. In most systems this would be comparatively insignificant, so far as domestic service is concerned, but owing to the very low pressure maintained here it was of vital importance. From the fact that this low pressure, originally determined by the limited head attainable with the old reservoir system, had been adhered to for so long a time, the plumbing in our city was of a very light character in many places, and a material increase of pressure would be attended by serious breakage. Consequently when the growth of the town demanded a higher head in certain localities than could be obtained from the reservoir, and direct pumping was resorted to, the system was divided into an upper and a lower service. On the upper service about nine pounds more pressure was maintained at the engines than on the lower, and

by this means it was intended to carry a very nearly uniform pressure throughout the city, as, if the flow of water were properly adjusted, there need not have been a variation of more than twelve pounds between any points of the system. From the fact that it was primarily the elevation of the ground which necessitated the adoption of this arrangement, it was to be supposed that the topography of the city would be a subject of very careful consideration in connection with the development of the plan, but actually it appears to have been entirely overlooked, for although this plan was adopted in 1886, and has been operated upon ever since, there was not to be found in the current records of the Construction Department, an elevation of a single point in the entire system at the beginning of last March. The Secretary, however, had on file in his office, the elevations of the several gauges he had located, and the records of the readings for the twenty months preceding. This information was turned over to the writer, and formed the nucleus about which the material was gathered which forms the bulk of this report.

Referring to the map of the system, opposite page 60, it will be seen that the supply from the pumping station reaches the business district through a 42-inch main in Jefferson Avenue, while the supply for the northern portion of the city flows through a similar main on Cadillac Boulevard and Mack Avenue, and thence *via* Collins Street and Canfield Avenue, traverses almost the highest district in the city. Passing westward along this line it will be seen that it connects with a 24-inch main running south in Vinewood Avenue. The designer, or, more properly, the developer of the system apparently at this point lost sight of two very important principles in hydraulics; first, that friction increases with the length of the channel; and, second, that water runs down hill. Had the situation been properly studied it would have appeared that instead of laying this main in Vinewood Avenue, a much more direct and level route would be obtained by connecting with some one of the down town mains to supply the southwestern district. The elevation of the corner of Vinewood

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It is a well known principle of hydraulics that if water flows in a tube from a higher to a lower level, whatever the path of the tube—if friction be not considered—the pressure at any point will be measured by the ordinate from the tube to the straight line joining the ends of it, so that if at any point the tube crosses this line the pressure there becomes zero and above the line a suction will exist. So in such a case if water be flowing under pressure in a pipe from a point A to a point C and there is a point B between the two at the same level as A, it will not have the same pressure as A because of the syphonic action of the water flowing away at C. This is just the condition which was produced by the above-described construction. The consumption of water in the low western part of town caused the pressure along Woodward and Cass Avenues to fall to less than three-fourths what it would have been had the water been consumed at that level instead of at the lower one.

Another error in the arrangement was in the treatment of the locality along Gratiot Avenue from Hastings Street north and east. This territory, it will be seen by the contour lines on the map, lies in almost the highest district in the city, but it was being supplied from the lower service, and the pressures obtainable were often insufficient for the needs of the manufacturing establishments there. Appeals from property own-

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Referring again to the map, it will be seen that the 130-ft. contour line, which runs from the city limits, near Wrenford Street, on the west, nearly parallel with Grand River Avenue, to Baggs Street, and thence, by an easy curve, eastward, crossing Woodward Avenue near High Street, and Chene Street at Mullett Street, divides the system about equally, both as to elevation and area, and it will be further noted, that the 120-ft. line divides the lower half about equally. The 130-ft. line is the one naturally selected as the division line of the upper and lower services, and the 120-ft. line, passing, as it does, very nearly along Abbott and Tenth Streets and Michigan Avenue, led to the selection of the latter route as the line of supply for the western district. During the month of June, before this line was completed, on account of many complaints in the northern part of the city, it became necessary to cut off the western district from the Canfield Avenue main, and to supply it through the Baggs Street main. To do this, the pressure on the low service system was raised sufficiently to supply the Gratiot Avenue territory, and the supply to the central portion of town was throttled to avoid excessive pressure. Under these conditions the system was operated from June 20 to

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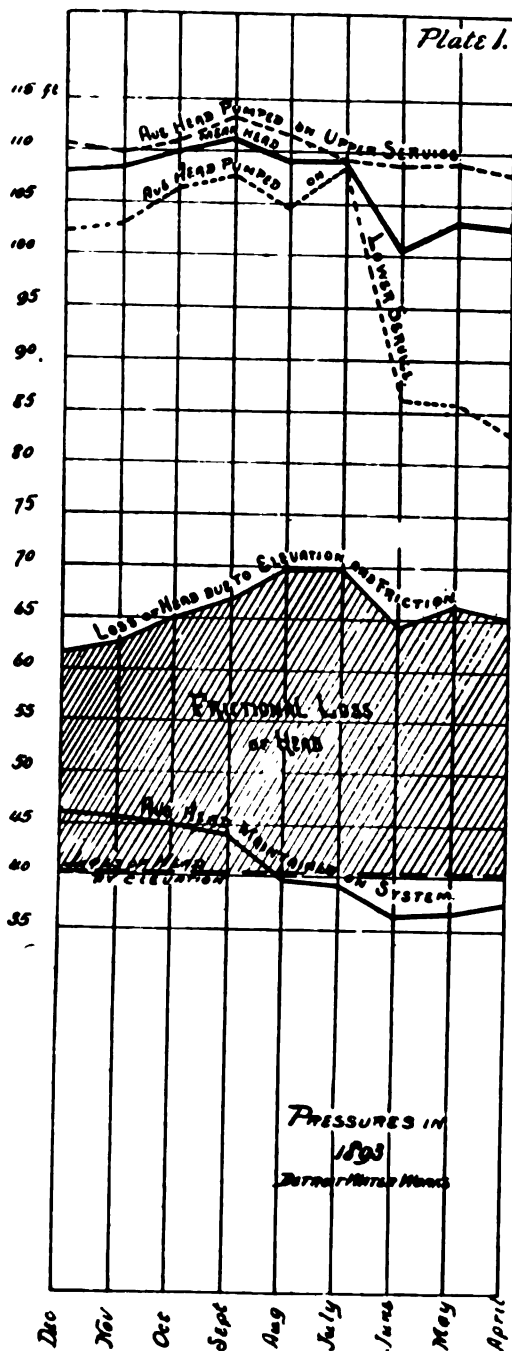
August 4, and the results are tabulated under the head of July. At the end of this time the Michigan Avenue line was completed and opened, when the system was readjusted to accord with the new condition. During the temporary July arrangement, it was incidentally demonstrated that while leading into the business portion of town there are two 30-inch mains, one 24-inch, one 16-inch, and one 12-inch main, the entire supply required for this portion of the city during these forty-five days, could be brought through one 30-inch main, with a gate in it closed to within one-fourth of the bottom of its opening. It therefore appears that the center of town is abundantly supplied with large pipe.

Upon the completion of the Michigan Avenue line, our attention was chiefly devoted to the construction of a 10-inch main along the eastern river front, for the better fire protection of the large manufacturing interests in that vicinity. This line was connected with the Jefferson Avenue 42-inch main at the corner of Meldrum Avenue, and thence was laid south on Meldrum Avenue to Wight Street, and thence, *via* Wight Street, McDougall Avenue and Guoin Street, connected to the old 8-inch main in Orleans Street, a 6-inch cross line being added on Adair Street, from Jefferson Avenue to the river. By the readjustment of the system the Bagg Street line was shut off at Grand River Avenue, and in order that the portion of the line west of this point, with the Fifteenth Street and Buchanan Street lines, might be used as a main artery for the lower service, the old 16-inch line in Miami Avenue and Park Street was extended from Washington Avenue up Park Street to Columbia Street, thence *via* Columbia, Cass, Gilman, Cherry and Sixth Streets, to connect with the Bagg Street line. This work was completed October 17, and finished the construction in connection with the readjustment of the system for this year.

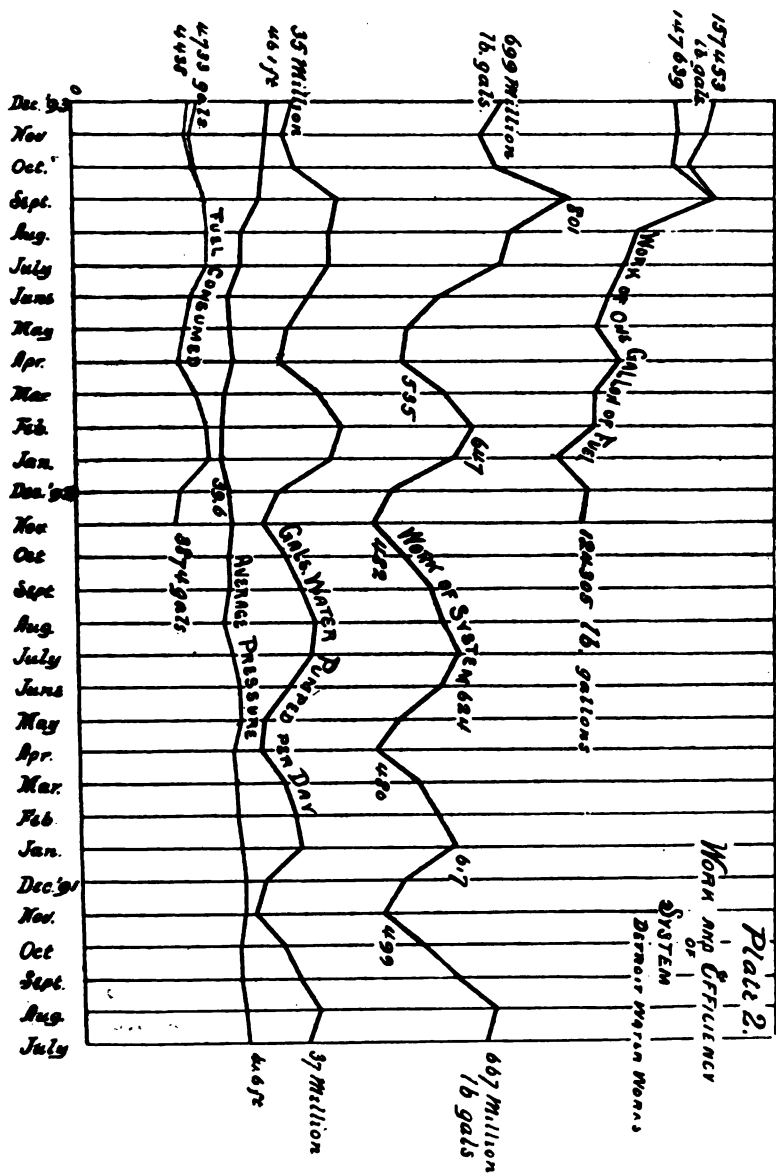
As to the results obtained by these operations we may state broadly that so far as we know, since the first of September we have been able to supply to all of our consumers as great a quantity of water, and at as high a pressure, as they have

demand, and we are equally well satisfied that it is at least several years since this condition existed before. To consider the subject more specifically, attention is first invited to Plate 1, on page 48, which shows the pressure record of the system for the last nine months of 1893. It is to be regretted that the records of the works do not furnish the data for extending the chart back further than the month of April, but, strange as it may seem, until that month there was no record kept of the head pumped against at the pumping station, and while the duty of the engines was figured on the basis of a head of 116 feet, it does not, in the light of the information embodied in Plates 1 and 2, seem possible that the mean pressure could ever have reached that point; for as shown on Plate 4, the quantity of water pumped the past year was greater than that pumped any preceding year except 1888, and the work done by the system as a whole has been decidedly greater than appears before while the average mean head at the engines has not exceeded 113 feet for any month. That such an immense gain in the efficiency of the system has been achieved, as can be proven if this old record is correct, is a claim that our regard for probability prevents us from maintaining.

The three lines at the top of Plate 1 represent the heads against which the engines worked, the full line being the mean head of the two systems. The lowest jagged line of the diagram shows the average pressure for each month on the distribution system as determined by readings on eleven gauges, taken hourly, as also were those at the pumping station, from which the upper lines were constructed. The difference between this last line and the line of mean head at the engines represents the amount of work expended in attaining the elevations of the various points in our system and in overcoming the friction in the pipe. These quantities have been plotted for the several months and give the line near the middle of the diagram. This amount of pressure is lost so far as obtaining work from it is concerned. A part of it, that expended in overcoming the elevation, represented by the ordinates below the line at 40.4 feet, cannot be reduced or



changed; but that part due to friction, represented by the ordinates of the shaded area will change from various causes. For instance, the frictional resistances increase with the velocity of flow, hence with the quantity of water pumped, and they also increase with the length of the pipe and the number and sharpness of bends. It appears from the diagram that the frictional loss in July was greater than it was in May or June because of the increased quantity of water pumped, but in August, though more water was pumped than in July, the frictional loss was less on account of the more economical adjustment of the system which was then being brought about, and the frictional loss has undergone a steady decrease since that time. In September it was 13 per cent. less than in July, though 3 per cent. more



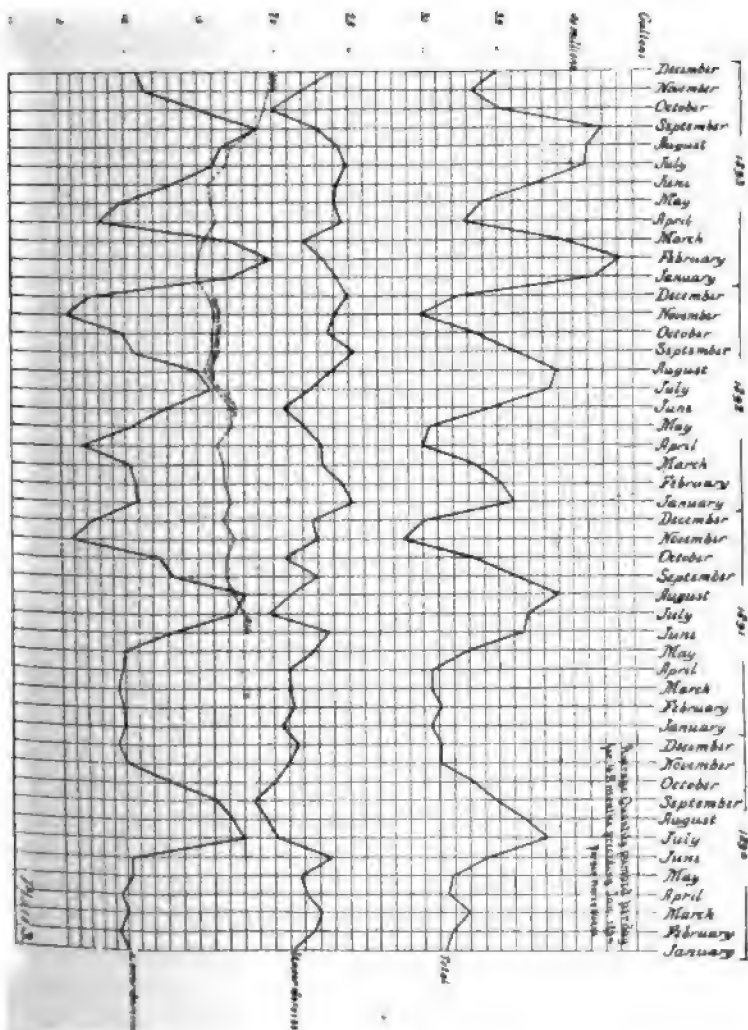
water was pumped. When it is remembered that any decrease in the loss of head means a corresponding decrease in the quantity of fuel consumed to maintain a given available pressure on the system, the importance of this subject will be appreciated. Comparing again the line of mean head at the pumping station with the line of average head on the system it will be seen that the latter has steadily increased since June, while the former has been decreasing since September. Here again comes in the item of cost, and it appears that we are giving our consumers 12 *per cent.* more pressure than we were able to give in July under the best arrangement we could devise and are pumping against a head only 92 *per cent.* as great.

We now leave the work of the engines as a separate factor and referring to Plate 2, page 49, we consider the system as a whole.

Beginning at the bottom of the diagram, we have first the fuel consumed each month since we have burned oil exclusively; second, the average pressures maintained on the system since July, 1891, the date of the establishment of the pressure gauges; third, the average number of gallons of water pumped per day; fourth, the available work of the system, *i. e.*, the product of the gallons pumped per day multiplied by the pressure maintained on the system, which product is designated pound-gallons; and fifth, we have the available work done by one gallon of oil, also in pound-gallons.

It is at once seen that there was less fuel burned in September than in July, although there was more water pumped in September, and, owing to the increased pressure, vastly more work done. From September it will be seen that the fuel line divides. The upper branch representing the total fuel consumed, including that for heating buildings, *etc.*, as well as pumping, while the lower branch represents the quantity used for pumping alone. Comparing now December, 1892, with December, 1893, we find that in December, 1892, 4,041 gallons of oil per day pumped 32,375,098 gallons of water, giving a pressure on the system of 15.69 pounds; and in December, 1893, making no correction for heating buildings, although the space

heated was fully 30 *per cent.* greater, we find that 4,733 gallons of oil pumped 35,026,431 gallons of water, giving a pressure of 19.95 pounds, or referring to the top line of the diagram, one gallon of oil did 125,703 pound-gallons of work in 1892, and 147,639 pound-gallons of work in 1893, showing a gain of over 17 *per cent.* which is a decrease in the cost of operation.



The upper line shows the fluctuations of the amount of work done by one gallon of oil since November, 1892, the lower branch being computed on the basis of the total fuel consumption and the upper one on the basis of the fuel actually used for pumping, and whichever line we choose to consider shows a marked improvement over the conditions of one year ago, or even of the first half of this year.

Turning now to Plate 3, which shows the quantity of water pumped in the upper and lower systems separately, and in the two combined by the upmost line, it is interesting to note that the total consumption has two maxima and two minima in the year. The first maximum is usually reached in January or February, and is due to the waste of water to prevent connections freezing; and the second occurs usually in August, and is due to the use of water on account of the hot weather. The minima occur about April and November, at which times there is the least demand for water on either of the above accounts. It is to be noted that the daily quantity of water allowed to run to waste in February of the past year exceeded that consumed in lawn sprinkling and other extraordinary uses during the hot months. In the dotted line of this diagram is again shown the variations of the average pressure since July, 1891, whence it appears that from a pressure of 18 pounds at that date, it continued generally to decrease until it reached its minimum in January and February, 1893, notwithstanding the efforts being put forth to recover it. In March, under the effects of a decreasing consumption, it began to recover slightly, and in April reached a temporary maximum, on account of the small quantity pumped and the partial readjustment of the old system. It fell with the increased pumping in May and June until the temporary arrangement before described was effected in July, since which time it has been steadily increasing, and this with the same engine and boilers at the pumping station which were, under former conditions, reported worked far beyond their capacity in 1891.

The average pressure on our system in December was, according to the eleven permanent gauges, 19.95 pounds. The

record of pressures from 97 hydrants on single readings, taken in November and December, shows the average of the system to be 24.16 pounds as compared with an average of 18.87 pounds for the same hydrants in March, and the average of 173 hydrants taken in November and December, and recorded in the column headed "December, 1893," on page 61, gives an average pressure of 24.41 pounds for the system, which is probably a very close approximation to the conditions. The greatest proportional gain noted in any one locality was at the corner of Kirby and Trumbull avenues, where the pressure had increased from 10 pounds in March to 19½ pounds in December, a gain of 95 *per cent.*

In the adjustments of the pressures and the distribution of the supply, we have endeavored to maintain the proposition that every citizen of Detroit is entitled to as much water at our hands as he is willing to pay for, and that he is entitled to it at the same pressure as his neighbor. While the contour of the ground will prevent the full realization of the latter part of the proposition, it may reasonably be expected that henceforth we will be able to supply fixtures on the third floor of any building within the city limits.

In Plate 4 we show the number of families supplied, the quantity of water consumed and the amount of pipe in service for each year from 1853 to 1893, inclusive. This information is interesting, as showing that while the first and the last items have maintained about the same relation to each other for forty years, the water consumption has increased much more rapidly than either. In the compilation of this data, the actual number of families supplied—counting each hotel as one family—is taken, excluding all mercantile and manufacturing establishments, it being satisfactorily proven that the consumption in such lines does not affect the family consumption, for if one such establishment is a necessary adjunct of a population of one hundred families, a similar establishment will be a necessary adjunct of every other one hundred families. This is not a theory, but was proven by your Secretary in his annual report for 1892.

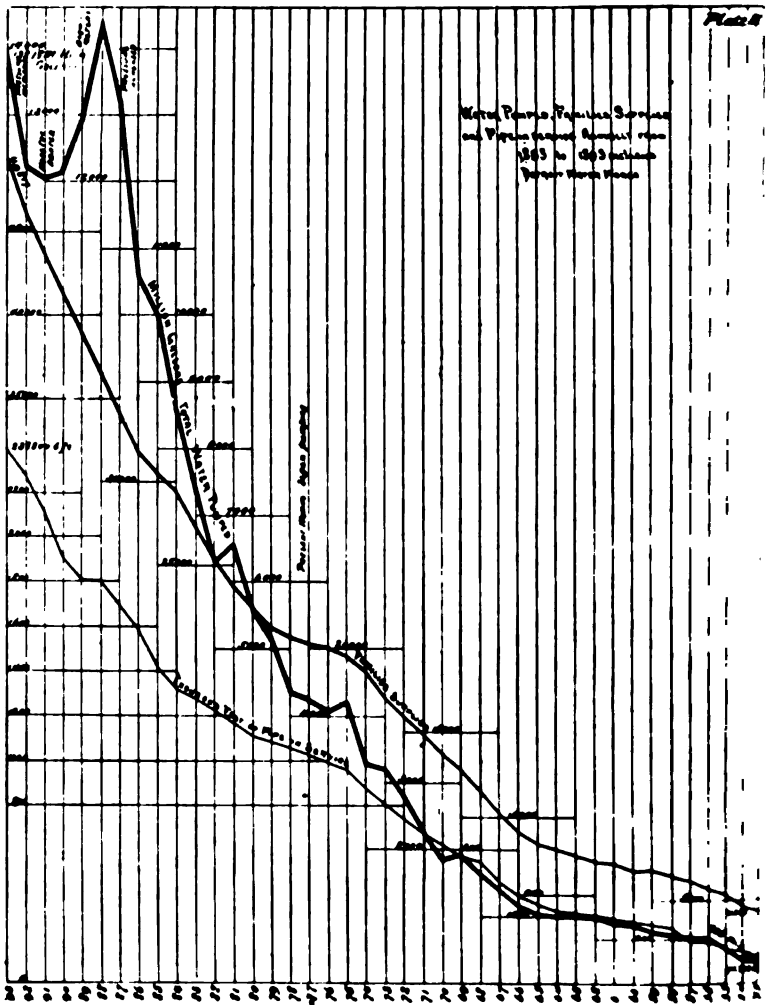
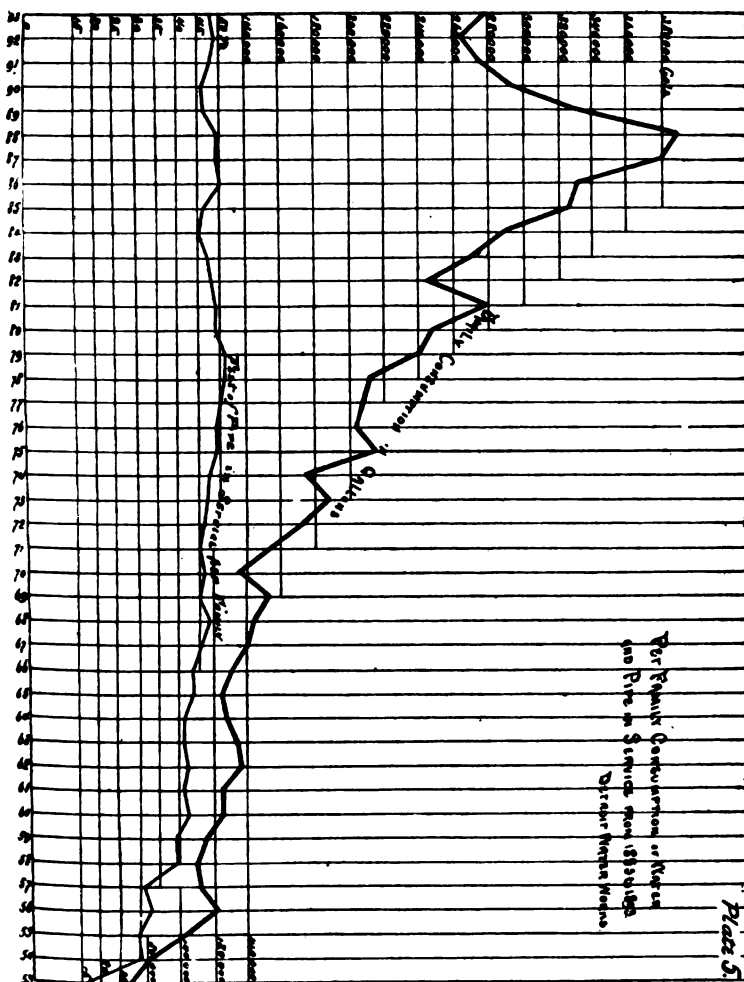


Plate 5 shows more clearly the annual increase of consumption per family, and also the feet of pipe in service per family, which latter has not varied ten feet since 1860, and having its maximum of 51 feet in 1878, has for 1893 fallen to 48 feet, thus showing that our distribution is becoming more concentrated.

We now come to the consideration of another very impor-



tant subject, that of Waste. The total average waste of water in our system, from the best information obtained as yet, appears to be about 60 *per cent.* of the entire quantity pumped. This, in this system as in any other, can be considered in two parts, which must be treated separately in any plan for its curtailment. The first portion to be dealt with, and the one most frequently receiving attention, is that due to the careless-

ness of man in handling the fixtures on his own premises; while the second comprises that due to defective construction. The former may be restricted in various ways, and its amount will vary greatly from time to time, but other things being the same, will increase with the population. The most satisfactory method of dealing with this part of the problem, is undoubtedly the meter system, and our consumers are many of them to be congratulated for not being required to pay the cost of what other persons use. The second part of the problem does not admit of so easy a solution. The waste due to defective construction will be changed only by variations of pressure and an increase or decrease of such construction. When we see that in our system there are about 430 miles of pipe that has never been tested in the sight of man, and that this means about 200,000 joints of all sizes, which, if reduced to equivalent four-inch joints, would be 411,000 that may be leaking for all any person knows, we must appreciate the probability of a very large part of our leakage being found here. During the past season, under the writer's immediate supervision, there have been taken up or uncovered in our system about three miles of pipe and in this the proportion of leaking joints was about 60 *per cent.* of the whole number nncovered. Everywhere was found evidence of the most careless work. Many joints appeared never to have been driven at all, and in others only the top was tooled. The latter was the case with a joint uncovered in a 42-inch main which must have been leaking for sixteen years, and had finally caused a settlement of the street car track for a space fully fifty feet in length. As there has not yet been devised any means of telling whether a joint is tight except to try it, it was recommended to require all joints to be tested in the open ditch under as high a pressure as may be available, and to be carefully inspected under pressure after they have been tested for some hours. This recommendation was approved by your Honorable Body, and has been strictly adhered to on that part of the work under the writer's charge, but it seems to have been treated with considerable indifference in other extensions. The remedy of defects in the old

work will require so large an expenditure that it does not seem likely ever to be considered except in specific cases where the leak is known positively to exist.

Another source of immense loss is the old-fashioned corporation cocks which were driven with a hammer into a hole drilled in the pipe with an ordinary ratchet and drill. The weight of the earth piled above, usually was sufficient to so loosen the cocks as to cause a continuous flow from them. This system of tapping became obsolete in most cities twenty years ago, and was superseded by the tapping machine which drills and threads a hole and screws a cock into it, making a perfectly tight connection without wasting more than a pint of water, although worked against a pressure of 160 pounds. The latter method was recommended to your Honorable Body and adopted in May last, and has since been in very satisfactory operation.

From the number of broken gates reported in our system and the leakage around the gate stems, it was considered advisable to construct around all gates in paved streets permanent wells of sufficient size to admit a man, so as to afford easy access in making necessary repairs. The advantages of this plan have had abundant proof even in the very short time it has been in vogue. During the year there have been constructed 639 such wells at a total cost of \$14,399.95, of which 480 were in old work and cost \$10,990.07, and 159 were in connection with new lines and cost \$3,409.88.

In addition to the previously described construction, a line of 10-inch pipe has been laid under the writer's supervision across the channel to supply Belle Isle Park. While this work has not yet been completed, the pipe has been successfully laid in place by the contractor.

On April 19 last, a fire broke out at the Kling Brewery, situated near the corner of Jefferson and Field Avenues, which developed one of the most serious minor defects of our system. It appears to have been the practice heretofore to lay large and small supply mains through districts they were intended to supply without connecting them to the cross lines.

From this defect a very serious loss was only averted by the good judgment of one of the Fire Department officials, who stationed two of the engines to take water from the river, while the other three actually pumped dry that portion of the city between Jefferson and Mack Avenues east of the Belt Line Railroad. An investigation revealed that there was in Jefferson Avenue a 6-inch main laid parallel with the 42-inch, but only connected to it at points 5,100 feet apart, and that the district north was supplied entirely from this 6-inch main, and all hydrants were connected with it. Your Honorable Body at once adopted the recommendation that cross-connections be put in at intermediate points, which work has been successfully accomplished without shutting off the water in the 42-inch main, and without any special machinery, by a contrivance of the writer's, the saving per connection over the Smith sleeve being about \$175 for 6-inch, and \$200 for 10-inch connections. That similar conditions exist elsewhere in our system is demonstrated by the records recently compiled in the draughting room, which, in maps showing 1,131 intersecting lines, reveal that 172, or over 15 *per cent.* of them, are not connected, and sixteen connections of old lines have been made this season.

The cost and extent of the various construction under your Civil Engineer's supervision has been as follows:

Michigan Avenue Line—

9,414 feet 24-in. pipe and 84 feet 16-in. pipe.....\$44,833 90

Meldrum, Wight, McDougall, Guoin and Adair St. Line—

7,870 feet 10-in. pipe and 1,248 feet 6-in. pipe..... 12,098 90

Park Street Line—

4,496 feet 16-in. pipe and 1,650 feet 12-in. pipe..... 20,878 17

Jefferson Avenue Cross-Connections—

2 10-in. and 8 6-in. connections..... 1 808 30

Belle Isle River Crossing—

8,550 feet 10-in. pipe to date..... 9,683 23

Work at Pumping Station, remodeling coal sheds and clearing canal bank.....

840 56

Making a total of\$89,158 23

The only line likely to come under the head of extraordinary construction during the ensuing year is the one already endorsed by your Honorable Body, to be laid across town at about the locality of Farnsworth Street, the estimates for which are \$55,000. The matter of a sufficient and effective means of removing from our system the accumulations of the past forty years is at present also under consideration. To correct an erroneous impression often voiced in the daily press regarding the efficacy of a settling basin in reducing the sediment in our water, it may be stated that in the periods of maximum demand the settling basin is emptied about twice every twenty-four hours, and about one and a half times in the periods of minimum consumption.

In August last the draughting room and records of the Iron Pipe Department were placed under the control of the Civil Engineer. Previous to that time the records of the department comprised an outline map of the entire city to a scale of 300 feet to the inch and memorandum records of pipe laid, journalized without drawings. Under the instructions of your Honorable Body the services of Mr. Clarence W. Hubbell were engaged as chief draughtsman, who assumed those duties September first and from whose report the following is abstracted :

The force in the draughting room has consisted, since September 1, of the Chief Draughtsman and two assistants with the services of a third a part of the time. One complete set of small scale city maps have been kept corrected up to date, and the compilation and preparation of a complete and intelligent record of the pipeage system has been commenced. For the latter it is contemplated to make a plat of each street and alley intersection, showing the location of all specials, gates, pipe and any other information of value. These plats are about 20x21 inches in size and are drawn to a scale of eight feet to the inch. When completed there will be about 8,000 tracings arranged in north and south streets, and 8,000 blue prints of the same arranged in east and west streets. On September 1, there were on hand 128 tracings and about 900

pencil drawings of intersections. All of the former have been corrected to date and two hundred of the latter have been traced and corrected, so that with new work we now have 788 new tracings, 128 old tracings, 205 new pencil drawings and 700 old pencil drawings, a total of 1,821 street and alley intersections. Excluding the 700 old pencil drawings not yet corrected, we have 1,121 plats brought up to date, covering 1,131 intersecting lines. In making this record every available source of information has been utilized, and while a perfect record is not possible under the circumstances, there being no serviceable record earlier than 1877 other than the annual report, it is expected that one as near the ideal as possible, and in convenient form for reference, will ultimately be obtained.

In closing this report it gives me more than ordinary pleasure to speak of the many very valuable suggestions and the hearty co-operation received at the hands of the Chief Engineer and his assistants at the pumping station, and much of the advantage of the present system of operation as deduced in this report is to be credited to the very skillful management of that part of the plant. The debt that is owed by our citizens to your Secretary must not be passed over without remark. That a man without special engineering training should have come to a conception, and so near to a correction of the evils of this system, where men of professed training in engineering lines had failed, is a matter of surprise and a cause for congratulation. Without the efforts which he put forth, the condition of a part of our city must have been serious indeed during the latter part of 1892.

This report is, gentlemen, very respectfully submitted.

G. S. WILLIAMS,
Civil Engineer.

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HYDRANT AND ENGINE HOUSE PRESSURES.

The north and south streets are arranged alphabetically in the first column. The east and west streets are arranged to read from south to north. Locations in small capitals are Permanent Gauges.

LOCATION.		Lbs. Pressure.		Feet Head.		LOCATION.		Lbs. Pressure.		Feet Head.	
N. & S. Streets.	Cross Streets.	1893.		1893.		N. & S. Streets.	Cross Streets.	1893.		1893.	
		Mar.	Dec.	Mar.	Dec.			Mar.	Dec.	Mar.	Dec.
Artillery.....	Fort.....	20.0	25.0	46.2	57.8	Elmwood.....	Fort.....	18.8	20.7	43.4	47.8
	Dix.....	24.0	28.0	55.4	64.7		Sherman.....	22.0	...	50.8	...
Beaubleau.....	Brady.....	14.0	18.5	32.3	42.7	Field.....	Waterloo.....	23.0	...	53.1	...
	Canfield.....	11.0	20.0	25.4	46.2		Champlain.....	29.0	...	67.0	...
Boulevard E.....	Boulevard.....	15.0	19.0	34.6	43.9	Fifth.....	Mack.....	25.0	27.0	57.8	62.4
	Jefferson.....	31.0	...	71.6	...		Gratiot.....	26.0	...	60.1	...
Boulevard W.....	Fort.....	23.0	26.5	53.1	61.2	Fifteenth.....	Plum.....	18.0	26.0	41.6	60.1
	Michigan.....	21.0	24.0	48.5	55.4		Fort.....	23.0	27.0	53.1	62.4
Brush.....	Grand River.....	16.0	19.5	37.0	45.0	Fourteenth.....	Baker.....	25.0	...	57.8	...
	Watson.....	14.0	21.0	32.3	48.5	Bagg.....	Michigan.....	25.0	...	57.8	...
Cedille.....	Jefferson.....	37.0	37.0	62.4	62.4		Bagg.....	18.0	24.0	41.6	65.4
	Farrand.....	40.0	...	92.4	...	Butternut.....	Butternut.....	19.0	24.0	43.9	65.4
Cass.....	Jefferson.....	31.0	...	71.6	...		Magnolia.....	17.0	25.0	39.3	57.8
	Congress.....	31.0	...	71.6	...	Buchanan.....	Buchanan.....	16.0	25.0	37.0	57.8
Bagg.....	Bagg.....	17.0	24.0	39.3	55.4		Jefferson.....	35.0	...	80.9	...
	Brainard.....	15.0	22.0	34.7	50.8	Fourteenth.....	Hudson.....	15.0	20.0	34.7	46.2
ALEXANDRIE.....	ALEXANDRIE.....	14.7	20.0	34.0	46.2		Boulevard.....	13.0	18.0	30.0	41.6
	Canfield.....	16.0	21.0	37.0	48.5	Grandy.....	Gratiot.....	12.5	19.9	28.9	46.0
Kirby.....	Kirby.....	12.0	17.5	27.7	40.4		Clifford.....	20.9	...	62.1	...
	AMSTERDAM.....	15.4	...	35.6	...	Hastings.....	Atwater.....	30.5	...	84.3	...
Cane.....	Congress.....	22.0	28.0	50.8	64.7		Jefferson.....	28.0	...	60.1	...
	Mullett.....	15.0	22.0	34.7	50.8	Congress.....	Congress.....	30.0	...	69.3	...
Chestnut.....	Chestnut.....	13.0	22.0	30.0	50.8		Congress.....	30.8	...	61.9	...
	Scott.....	11.0	21.0	25.4	48.5	Champlain.....	Champlain.....	26.0	...	60.1	...
St. Joseph.....	St. Joseph.....	12.0	22.0	27.7	50.8		Columbia.....	19.0	22.0	43.9	60.8
	Canfield.....	17.0	19.0	39.3	43.9	Watson.....	Watson.....	14.0	20.0	32.3	46.2
Ferry.....	Ferry.....	14.0	17.0	32.3	39.3		Hubbard.....	24.1	26.3	55.7	60.8
Clifford.....	Columbia.....	18.0	26.0	41.6	60.1	Humboldt.....	Myrtle.....	20.0	22.0	46.2	50.8
Collins.....	Gratiot.....	20.0	23.0	46.2	53.1		Buchanan.....	17.0	22.0	39.3	50.8
	Canfield.....	18.0	21.0	41.6	48.5	Jos. Campan.....	Quinn.....	35.0	...	80.9	...
Ferry.....	Ferry.....	16.0	19.0	37.0	43.9		Jefferson.....	29.0	...	67.0	...
	Medbury.....	15.0	19.0	34.7	43.9	Lafferty.....	Fort.....	20.0	27.0	46.2	62.4
Commonwealth.....	Grand River.....	18.0	25.0	41.6	57.8		Leib.....	33.0	...	76.2	...
	Congress.....	30.4	...	70.2	...	Livernois.....	Toledo.....	26.0	...	60.1	...
Concord.....	Jefferson.....	35.0	...	80.9	...		Stark.....	24.0	26.0	55.4	60.1
	Mack.....	32.0	...	73.9	...	Buchanan.....	Buchanan.....	23.0	27.0	53.1	62.4
Crawford.....	Bagg.....	16.0	24.0	37.0	55.4	McClellan.....	Farrand.....	35.0	...	80.9	...
	Tuscola.....	16.0	25.0	37.0	57.8		Mack.....	34.0	...	78.6	...
Brigham.....	Brigham.....	13.0	26.0	30.0	60.1	Gratiot.....	Gratiot.....	31.0	...	71.6	...
	Putnam.....	19.0	...	43.9	...	McDougall.....	Monroe.....	20.0	23.0	46.2	53.1
Kirby.....	Kirby.....	11.0	17.5	25.4	40.4		...	...	...	...	...
	Boulevard.....	16.5	...	38.1	...						
Fourth.....	Fourth.....	16.5	...	38.1	...						

HYDRANT AND ENGINE-HOUSE PRESSURES—Continued.

LOCATION.		Lbs. Pressure.		Feet Head.		LOCATION.		Lbs. Pressure.		Feet Head.	
N. & S. Streets.	Cross Streets.	1893.		1893.		N. & S. Streets.	Cross Streets.	1893.		1893.	
		Mar.	Dec.	Mar.	Dec.			Mar.	Dec.	Mar.	Dec.
McKinstry.....	Toledo.....	24.5		56.6		Sullivan.....	Magnolia.....	19.022	0.43	930.5	
Meldrum.....	Wight.....	32.5		75.1			Grand River.....	15.020	0.34	748.2	
	Jefferson.....	28.028	0.53	164.7		Tenth.....	Abbott.....	19.026	0.48	940.1	
	Congress.....	23.027	0.53	162.4			Michigan.....	24.5		56.6	
Mt. Elliott.....	Champlain.....	32.0		73.9		Third.....	Jefferson.....	35.0		82.3	
	Waterloo.....	25.0		57.8			Congress.....	31.0		71.6	
	Mack.....	33.0		83.1			Michigan.....	19.027	0.43	932.4	
	SYLVESTER.....						Canfield.....	16.022	0.37	620.8	
	Gratiot.....	24.0		53.1			Kirby.....	12.017	5.27	743.4	
Orleans.....	Guoin.....	37.5		86.8		Thirteenth.....	Grand River.....	15.023	0.34	733.1	
	Jefferson.....	29.0		67.0		Tillman.....	Warren.....	21.5		49.7	
	Champlain.....	25.0		57.8			Stanley.....	14.018	0.22	341.6	
	Mullett.....	19.027	0.43	932.4		Trumbull.....	Michigan.....	19.026	0.43	940.1	
	Scott.....	12.019	0.27	743.9			Bagg.....	17.023	0.39	533.1	
Randolph.....	JEFFERSON.....	21.026	0.48	560.1			Brigham.....	13.022	5.30	626.0	
	Jefferson.....	27.0		62.4			Kirby.....	10.019	5.28	145.0	
	Congress.....	23.031	0.53	171.6			Holden.....	18.0		41.6	
Raynor.....	Gratiot.....	20.022	0.40	250.8		Twelfth.....	Magnolia.....	17.022	0.39	320.0	
Riopelle.....	Mullett.....	20.028	0.46	264.7		Twentieth.....	Howard.....	23.025	0.50	537.5	
Russell.....	Gratiot.....	15.020	0.34	746.2			Standish.....	24.0		55.4	
	Montcalm.....	15.020	0.34	746.2			Ross.....	25.5		54.9	
	HIGH.....	13.018	3.31	242.3			MICHIGAN.....	24.5		56.6	
	Watson.....	14.019	5.32	345.0		Twenty-first.....	Dalselle.....	19.024	0.43	933.4	
	CALHOUN.....	17.6		40.7		Twenty-fourth.....	Dalselle.....	20.024	0.46	255.4	
	Indiana.....	15.019	0.34	643.9			Butternut.....	21.024	0.49	535.4	
	Canfield.....	15.019	0.34	643.9		Twenty-ninth.....	Buchanan.....	20.025	0.46	257.0	
	FERRY.....	9.012	5.22	228.9		Van Dyke.....	Jefferson.....	33.0		73.2	
	Ferry.....	14.016	0.32	337.0			Walnut.....	31.0		71.6	
Scotten.....	MICHIGAN.....	21.723	5.50	154.3			Mack.....	30.0		69.3	
Second.....	Grand River.....	34.5		56.6			Gratiot.....	28.0		64.7	
	Bagg.....	17.024	0.39	535.4		Vinewood.....	Fort.....	22.025	0.50	540.1	
Seventh.....	Fort.....	28.0		64.7			Porter.....	27.5		63.3	
Sixth.....	Congress.....	32.0		73.9			Toledo.....	20.025	0.49	537.5	
	BAKER.....	17.425	4.40	258.7			A Street.....	21.025	0.49	537.5	
Sixteenth.....	BAGO.....	16.024	7.57	0.57.1			Magnolia.....	21.025	0.49	537.5	
	GRAND RIVER.....	13.516	9.31	939.0			Buchanan.....	21.024	0.46	535.4	
St. Antoine.....	Winder.....	30.0		46.2		Wabash.....	Dalselle.....	20.025	0.46	257.4	
	Watson.....	30.0		46.2		Wayne.....	LARNED.....	22.5		71.4	
	Indiana.....	19.0		43.9		Woodward.....	Atwater.....	25.5		61.0	
	Theodore.....	18.0		41.6			Jefferson.....	26.0		64.7	
	Ferry.....	18.0		41.6			Congress.....	11.0		71.6	
	Harper.....	17.0		39.3			Michigan.....	27.0		62.4	
St. Aubin.....	Guoin.....	36.0		83.2			Park.....	27.0		62.4	
	Congress.....	24.028	0.55	64.7			Columbia.....	18.026	0.41	630.1	
	Mullett.....	22.5		54.0			High.....	25.0		57.8	
	Antietam.....	31.0		64.5			Bagg.....	16.021	5.27	0.69.7	
	Brewster.....	30.0		46.2			Parsons.....	18.028	5.41	634.3	
	Hale.....	19.5		45.0			Canfield.....	16.020	2.47	0.67.4	
	Illinois.....	11.020	0.25	440.2			Farnsworth.....	18.5		44.7	
	Canfield.....	21.0		48.5			Ferry.....	14.018	0	41.6	
	Forest.....	30.0		46.2			Piquette.....	17.0		40.4	
	Farnsworth.....	30.0		46.2			Boulevard.....	17.0		39.3	
	Ferry.....	19.0		43.9			Holbrook.....	16.0		39.3	
	Boulevard.....	19.0		43.9			Englewood.....	15.0		34.7	

REPORT OF SUPERINTENDENT OF METERS AND INSPECTION.

DETROIT, January 2, 1894.

To the Board of Water Commissioners:

GENTLEMEN—In compliance with the rules of your honorable body, I herewith report the work done in the Meter, Inspection and Service Cocks Departments during the year 1893.

The following tables show the number of meters placed, the number removed, and the total number in service on the 31st day of December, 1893:

Placed in 1893.

	SIZES.							Total
	5/8 in.	3/4 in.	1 in.	1 1/4 in.	2 in.	3 in.	4 in.	
Total number placed during the year 1893.....	334	151	97	17	21	4	4	628

Removed in 1893.

	SIZES.							Total
	5/8 in.	3/4 in.	1 in.	1 1/4 in.	2 in.	3 in.	4 in.	
Service connections discontinued....	32	3	7	1	1	1	.....	45
Premises vacant.....	4	.....	10	2	1	.....	.....	17
For repairs, and replaced with other meters	7	2	10	1	1	1	.....	22
Too small for required supply.....	2	.....	1	.....	.....	.....	.....	3
Too large for required supply.....	.....	.....	10	4	1	.....	.....	15
Total number removed.....	45	5	38	8	4	2	.....	102

Meters in Service Jan. 1, 1894.

	SIZES.							
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{4}$ in.	2 in.	3 in.	4 in.	6 in.
In service Jan. 1, 1893.....	923	405	466	76	103	57	23	2
Placed during the year, and in service Jan. 1, 1894.....	369	146	59	9	17	2	4	.....
Total number in service Jan. 1, 1894.....	1212	551	525	85	119	59	26	2

The following tables show the kind and sizes of meters placed during the year, also those removed:

Placed in 1893.

KIND.	SIZES.							
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{4}$ in.	2 in.	3 in.	4 in.	Total
Thomson	205	140	80	13	19	2	3	571
Crown	4	.....	2	2	.....	1	.....	9
Hersey .....	.....	.....	3	2	1	1	1	6
Worthington	6	2	1	.....	.....	.....	.....	9
Neptune	25	.....	1	.....	1	.....	.....	26
Union Duplex .....	.....	.....	1	.....	.....	.....	.....	1
Union Rotary	2	.....	.....	.....	.....	.....	.....	2
	334	151	97	17	21	4	4	623

Removed in 1893.

KIND.	SIZES.							
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{4}$ in.	2 in.	3 in.	4 in.	Total
Thomson	35	3	21	2	3	1	.....	65
Crown	3	1	4	2	.....	.....	.....	10
Hersey	1	1	9	3	.....	.....	.....	14
Worthington	5	.....	2	1	1	1	.....	10
Union Rotary .....	.....	.....	1	.....	.....	.....	.....	1
Neptune	1	.....	.....	.....	.....	.....	.....	1
Union Duplex .....	.....	.....	1	.....	.....	.....	.....	1
	45	5	38	8	4	2	.....	102

BOARD OF WATER COMMISSIONERS.

The following table shows the total number of meters in service and the different kinds and sizes, also indicators attached to hydraulic elevators:

In Service Jan. 1, 1894.

KIND.	SIZES.									Total
	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{8}$ in.	2 in.	3 in.	4 in.	6 in.	Indi- cat'rs	
Thomson.....	1,119	539	418	68	79	38	10	2	.....	2,268
Crown.....	40	15	46	11	18	9	4	.....	.....	189
Hersey.....	2	3	88	1	13	2	8	.....	.....	67
Worthington.....	15	4	17	2	12	9	3	.....	.....	62
Union Rotary.....	11	.....	1	2	2	1	1	.....	.....	18
Neptune.....	25	.....	1	.....	1	.....	.....	.....	.....	27
Duplex.....	.....	.....	2	.....	.....	.....	.....	.....	.....	2
Equitable.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Ball & Fitts.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Indicators.....	.....	.....	.....	.....	.....	.....	.....	.....	9	9
Total No. in use Jan. 1, 1894.....	1,212	551	525	84	120	59	26	2	9	2,588

Meters in Stock.

KIND.	SIZES.							
	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{8}$ in.	2 in.	3 in.	4 in.	Total
Thomson.....	13	1	5	6	2	2	1	30
Crown		1	2	1				4
Hersey		1	10	2				13
Worthington ..			1		1			2
Union Rotary ..			6					6
Neptune.....	2							2
	15	3	24	9	3	2	1	57

Tools and Materials on hand.

Valuation of meters in stock, January 1, 1894.....	\$1,161 00
Valuation of material on hand, January 1, 1894.....	252 35
Valuation of tools, January 1, 1894.....	401 24
Valuation of horses, wagons, etc., January 1, 1894.....	442 00
	<u>\$2,256 59</u>

Meters in Service.

Valuation of meters in service, Jan. 1, 1893.....	\$68,733 99	
Deduct 10 per cent. for depreciation in value....	6,873 39	
		\$61,860 60
Add amount expended during the year for meters placed.....	\$18,753 16	
Less amount received for meters sold to Park Commissioners.....	785 30	
		17,967 86
		\$79,824 46
Less stock on hand, January 1, 1894.....	2,256 59	
Total valuation of meters in service, January 1, 1894.....		\$77,571 87
Cost of material used in repairing meters in 1893.....		38 11
Cost of labor in repairing meters in 1893.....		649 50
Total cost of repairs for 1893.....		\$687 61

Summary of total amount expended in the meter department for the years 1889 to 1893, inclusive:

	1889	1890	1891	1892	1893	Aggregate
Meters	\$11,175 00	\$19,700 00	\$6,501 55	\$12,371 82	\$6,987 43	\$56,735 80
Supt. and labor.....	1,734 10	8,510 37	4,841 49	4,369 17	8,940 48	\$28,395 61
Material, tools, etc.	637 26	2,982 14	872 99	2,132 93	1,650 33	\$9,275 65
Freight, hauling, etc.	98 05	408 37	197 11	244 08	165 12	\$1,113 23
Horse, wagons, etc.				847 94	184 50	1,032 44
Total.....	\$13,644 41	\$30,601 68	\$12,413 14	\$20,565 24	\$17,967 86	\$95,192 32

In presenting this report to your honorable body, I am pleased to say that the affairs in the Meter Department have moved along during the past year very satisfactorily, and without any material change from former years. We have placed 526 meters, making the total number now in use, 2,579.

Nothing has transpired that tends to shake our faith in the wisdom shown in adopting the meter system four years ago.

There has been a great change in the minds of water takers since the meter system was first adopted. At that time almost every person was afraid that their rates would be increased

by the use of a meter, so much so, that some of them, on the first indication that we contemplated placing a meter on their premises, would rush to the office and pay six months' or a year's rates in advance at the estimated assessment, rather than take the chance of paying by meter rates. One party, who had been paying \$60 per year on his factory, when he saw us preparing to meter his premises, hurried to the office and paid six months' rates, \$30, in advance, and went away gloating over the idea of his shrewdness. Nevertheless we placed the meter, and at the end of six months found that he had used just \$12 worth of water, for which he had paid \$30, but he considered it such a good joke on himself that he never applied for a rebate. Such instances go to prove that the meter is much more accurate than an estimator in arriving at the quantity of water consumed. But, as I said before, the minds of water takers have changed in a great degree, as the larger proportion of meters placed now are on the premises of those who apply for them, as they prefer paying by meter rather than the estimated rate (one hundred and fifty of such applications having been received during the past six months). There are some who object to the paying of their meter rates monthly, especially the small consumers, claiming that they ought not to be obliged to come to the office every month to pay the small sum of seventy-five cents, that being the minimum rate, and an amount which a considerable number pay. It is possible that it would be advisable to make a rule allowing all bills below a fixed amount to be paid quarterly, and above that amount monthly. In any event it would be necessary to read the meters each month as a matter of protection to the consumer as well as that of the meter, inasmuch as leaks are continually occurring which increase the consumption unnecessarily, and sometimes to a large amount, and by a monthly reading consumers are made aware of the fact, and can make the necessary repairs, so that the next month's consumption will only amount to the legitimate uses, whereas, if meters were allowed to go three months without reading, it would often make the consumer pay for a large quantity, of which the greater portion would be waste. Even

with monthly readings, all consumers should learn to read their meters, and by so doing would detect leaks whenever they occur, as an undue consumption would immediately lead to an investigation. If all large consumers would read their meters each day, it would insure them against paying any large amount for waste, something that has occurred at different times in the past. In some cases forty or fifty dollars have been paid in one month for waste alone, when, if the register of the meter had been taken each day, nearly the whole amount could have been saved to the consumer.

The cost of repairing meters has increased during the past year, owing to the increased number in use, and also to the fact of the last winter being a very severe one. We had quite a large number frozen, but were able to repair very nearly all of them, the cost of which was principally for labor only, as the material required was trifling. We have thirty of the smaller sizes, mostly $\frac{3}{8}$ -inch, which we are unable to repair. They are an accumulation of four years, and to send them to the factory for repairs would cost more than we are now paying for new meters, which, if frozen, we can repair ourselves, without any more cost than that of labor, a fact that has saved us in the past, and will continue to save in the future, a large amount in repairs. Meters are supposed to be placed where there is no danger of frost, but after all of our precautions they do not all escape, because the frost often catches the service pipe, several feet from the meter, and will follow along the pipe until it eventually reaches it. Sometimes they are frozen through the carelessness of the occupant, who leaves the cellar window or door open, and exposes the meter, but where it is clearly the fault of the occupant, our rules now provide that he shall pay the cost of repairs. Of the 2,579 meters in service, 712 of them are in pits outside of the buildings, and protected with iron covers, none of which have ever been frozen.

In compliance with a resolution of your honorable body requiring meters to be placed on some of the public school buildings, police stations, and fire engine houses as a matter of information to know about the quantity of water that is being

furnished to said institutions, I have had meters placed on three school buildings, two police stations and two engine houses with the following results :

The Cass School in four months consumed 936,100 cubic feet, equal to 7,020,750 gallons and the average attendance being 942 makes an average daily consumption of 62 gallons per capita, or in other words about two barrels per day for each attendant. The Bishop School with an average attendance of 1,015 consumed in the same length of time 435,200 cubic feet, or 3,264,000 gallons, being an average daily consumption of 27 gallons per capita, or not quite half as much as the Cass School, while the Barstow School with an average attendance of 465 consumed 18,400 cubic feet, or 138,000 gallons, being an average of $2\frac{1}{2}$ gallons per capita daily. The latter building is provided with the "dry closets" which, I presume accounts for the small consumption in comparison with the others. The enormous consumption at the Cass shows that we were correct in claiming that a very large and needless waste is continually going on in some, if not all, of the school buildings. Taking the three buildings as an average and we have a consumption of between two and three hundred million gallons per year, and at one-third of a cent per 100 gallons would amount to over \$7,000, while we are collecting from the Board of Education for water used in public schools \$1,071. I have no doubt but the amount paid is ample for all legitimate uses, and I also think that when the proper authorities are shown the large waste that is going on in the schools throughout the city, that they will take the necessary means to largely reduce it.

The Central Police Station consumed 100,400 cubic feet in four months or at the rate of 301,200 cubic feet per year, which at one-third of a cent. per 100 gallons would amount to \$70.30, while their estimated assessment on the premises, and which they pay, is \$70.00, showing the estimated and meter rate almost precisely the same. At the Woodbridge Street Station there was 24,900 cubic feet consumed in the same length of time, or at the rate of 74,700 cubic feet per year,

and at the same rate per gallon would amount to \$18.67, while they are paying a rate of \$16.00 per year, showing also a very close comparison between meter and estimated rates. It is fair to presume that the eight remaining stations are paying about the same ratio of rates, which would prove very conclusively that there is not much waste taking place in that department, for which the officials in charge are entitled to credit.

The consumption of water in the engine houses (on which there is no assessment) is not large and shows that there is very little waste in that direction. Engine House No. 10 consumed 3,000 cubic feet in 40 days, and Engine House No. 11 consumed 5,500 cubic feet in the same length of time. If the foregoing is a fair average there would be consumed in the twenty-eight engine and truck houses something over 1,000,000 cubic feet per year, not a very exorbitant amount considering the number of persons employed therein, and also the horses, carriages, etc., that are cared for. It would show a very careful surveillance over the water fixtures throughout the buildings of the fire department, if the foregoing is a fair average, which I have no reason to doubt that it is.

INSPECTION.

No change in the working of this department has been made during the past year with the exception of the addition of one more examiner, making five in all. It is impossible for four men to get over the city twice each year, as so much of their time is taken up—about one-third—in reading meters and delivering meter bills, and as two examinations each year is absolutely necessary, I was obliged to ask for another examiner. With all the diligence shown, however, the percentage of leaks is increasing each year. In 1891 the percentage of leaks to number of examinations made was 4.77, in 1892, 6.63, and in 1893, 7.77. There is very little attention paid to the repairing of leaks by the majority of water takers until they are compelled to do so by a threat to shut off the water. In some instances leaks are going on without the knowledge of the occupant, who is first made aware of it by a notice from

the examiner, but whether they know it or not it makes very little difference, for the repairs are seldom made until they get a peremptory notice to do so. This of course refers to unmetered connections, as there is no trouble to get repairs made on connections that are metered, unless it be that portion of the service pipe between the street main and the meter, for at that point the direct cost to the consumer is nothing, while it puts it upon the city at large, a fact that would lead to an indiscriminate and endless waste, were the individual consumers not held responsible for the water used on their premises. The increased pressure throughout the city during the past three years has undoubtedly had a great deal to do with the increased number of leaks, more particularly during the last season as the pressure has been increased very materially in a large portion of the city, the average being about five pounds. Previous to the year 1891 our rules allowed the use of lead service pipe known as "medium," which answered all purposes while the pressure remained as it did when the rule was adopted, but, as the leaks increased, we found it due in many cases to the lightness of the service pipe, and on January 1st, 1891, the Board adopted a rule allowing nothing lighter than pipe designated as "strong" which will undoubtedly be the means of preventing many leaks in the future; but I anticipate numerous leaks and large waste while there remains so much "light"—as there seems to have been a time when any kind was allowed—and "medium" pipe throughout the city.

Another source of waste we have had to contend with during the past season was caused by many who allowed the water to run continually, claiming that they were ordered to do so by the Health Officer, and while there is no doubt many of them received such orders, many more made the same claim who had received no such notice, but in all cases our examiners notified them that no such permission had been granted by the Board of Water Commissioners, and until they were given such permission it could not be allowed, and as the necessity or advisability of such orders from the health officers was of a doubtful nature, the consumers, as far as we were able to judge,

willingly complied with our notice to discontinue the practice.

The examiners made 55,086 examinations, reported 4,271 leaks, 3,984 of which were repaired on due notice being given, and 287 were ordered to be shut off for failure to make necessary repairs.

SERVICE CONNECTIONS.

On the first of last July, the Service Connections was transferred by the Secretary from the Iron Pipe to my department, and about the same time the mode of making such connections was changed also.

It has been evident for some time past that with the increased pressure added to our mains throughout the city, the time had come for the changing of the "drive cock" system to a more secure way of inserting them. They have been a source of a great deal of trouble on account of their liability to be blown out or become loose, causing numerous leaks and large waste, and thereby adding largely to the expense of the department of repairing leaks.

After consulting Secretary Case and myself, Civil Engineer Williams recommended to your honorable body the purchasing of three "Muehler Tapping Machines," the machines to cost \$85 each, and with the necessary appliances—such as saddles, etc.—for operating the same, an additional cost of \$25; making the total cost \$280, to commence operation under the new system. As your honorable body complied with the recommendation, the machines were purchased and have been in operation since that time.

These machines drill the hole and insert the cock with a screw under pressure without the escape of any water whatever. Under the former system the tapper drilled the hole nearly through the pipe, then inserted the cock, and by giving it a sudden blow with the hammer would drive it into place, a small portion of the pipe breaking away and dropping inside. If by any chance, through a defect in pipe or otherwise, the cock did not fit properly, it would often blow out and deluge the

tapper with water, besides causing much trouble, sometimes making it necessary to shut off the line before the connection could be made, something that cannot occur with the Muehler machine.

The cost of operating it is about the same as the old way, but there is a difference in the cost of the Muehler over the drive cock of 14 4-10 per cent, making the increased cost on total number inserted (1,900) up to January 1st, 1894, \$151.24; a trifling amount when compared with the saving it will surely bring about in the future.

The Smith machine, purchased by the Board at a cost of \$850, in the latter part of 1892, for making 2-in., 3-in., 4-in., and 6-in. connections under pressure, has proven itself to be all that the inventor claimed for it. It is a wonderful improvement over the old way of making such connections, and also saves a large amount of labor.

With this machine it is not necessary to shut off the street main when making a connection. The sleeve, with valve attached, is simply leaded around the pipe, the valve opened, when the drill passes through the valve, cuts a core from the pipe of the required size, withdraws said core back of the valve, which is then closed, when the core is removed and the connection is completed.

Formerly, in making a connection larger than 1 inch, the line of pipe on which such connection was made had to be shut off, and before doing so, each consumer on the line received a personal notice to that effect. That being done, the work of shutting off began, and it was necessary to shut all the way from two to ten gates—at one time seventeen—before the water was entirely shut off; then the hole was cut in the pipe. After that the water had to be removed, as usually the larger portion of the water in the district shut off had to be removed from the ditch before the joints could be leaded. And as it often happened a perfect shut-off could not be obtained—through defective gates—the labor of removing the water was increased, and the condition of the men when through was often deplorable. Then again, nearly all such connections had to be

made in the night, thereby adding largely to the expense, as the district deprived of water usually included factories or some one who could not get along without water while the connection was being made, therefore making it necessary to do it after business hours, and often after 12 o'clock at night, as we never compelled factories to shut down or deprived large hotels, etc., of water until after that time, unless it was absolutely necessary. And again, in closing gates there is always a possibility of breaking them, something that has often occurred, and which has been very expensive, also. But all such difficulties and annoyances have been done away with by the use of the Smith machine. It has saved the Water Works much money, and also the tappers from many a cold bath during the time it has been in operation.

The total expense of the Service Cocks Department, including labor, material and inspection, amounts to \$10,278.83. Of that amount, \$3,912.50 should be deducted, as it represents the labor of the inspectors of new work, whose duties are principally confined to the inspection of plumbing and keeping the records of work done in that line throughout the city. The report of their work in detail is shown in a table following this statement of the service cocks proper, viz.:

Receipts for service cocks.....	\$6,615 65	
Receipts for plumbers' licenses.....	635 00	
		\$7,250 65
Total expense Service Cocks Department.....	\$10,278 83	
Less labor of inspectors.....	3,912 50	
		\$6,366 33
Balance to the credit of service cocks.....		\$684 33

The following table shows the duties performed by the inspectors of new work during the year 1893:

INSPECTION OF NEW WORK.

	WARDS.	Calls for Non-payment.	Shut for Non-payment.	Examined New Connections.	Examined Extens's and Fixtures.	Let on New Connections.	Notified for Building Tax.	Shut for Vacancy.
Michael Hart.....	8, 10 and 12	1,950	496	403	391	300	20	30
John Hatzenbuehler.....	7, 9 and 11	2,019	162	376	390	237	25	30
John Becker.....	2, 4 and 6	2,145	239	326	250	248	78	90
Adolph Jasnowski.....	14 and 16	1,908	209	472	325	169	33	19
C. J. Skinner.....	1, 3 and 5	2,428	109	265	340	307	114	187
Robert Pelham, Jr.....	13 and 15	2,024	220	573	310	308	38	72
TOTAL.....		12,464	1,425	2,415	2,006	1,569	306	418

In addition to the above work, the inspectors have devoted considerable time in examining and locating stop boxes, and ordering them exposed to sight, repaired or replaced with new ones as the case required. It necessitates the utmost vigilance to keep the stop-boxes exposed to view. Sidewalks being repaired, new ones built, or change of grade in street, alley or lot, the tendency is to pay little attention to the stop-box, and it is usually covered up, as the majority of water takers can see very little use for it until there is an urgent request for shutting off the water in case of bursted pipes, etc., when they have a forcible reminder of its necessity. Not only that, but during the last year there have been 12,464 places reported to be shut off for non-payment, besides many places for vacancy, showing the need of keeping the stop-boxes in sight at all times. A duty that will always exist will be that of seeing they are kept in proper condition, and as there are thousands of them, and increasing daily, one can readily see that it will require much time and watchfulness on the part of the inspectors in giving them the necessary attention.

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The total expense of the Service Cocks Department, including labor, material and inspection, amounts to \$10,278.83. Of that amount, \$3,912.50 should be deducted, as it represents the labor of the inspectors of new work, whose duties are principally confined to the inspection of plumbing and keeping the records of work done in that line throughout the city. The report of their work in detail is shown in a table following this statement of the service cocks proper, viz.:

Receipts for service cocks.....	\$6,615 65	
Receipts for plumbers' licenses.....	685 00	
		\$7,350 65
Total expense Service Cocks Department.....	\$10,278 83	
Less labor of inspectors.....	3,912 50	
		\$6,366 33
Balance to the credit of service cocks.....		\$884 33

The following table shows the duties performed by the inspectors of new work during the year 1893:

INSPECTION OF NEW WORK.

	WARDS.	Calls for Non-payment.	Shut for Non-payment.	Examined New Connections.	Examined Exten's and Fixtures.	Let on New Connections.	Notified for Building Tax.	Shut for Vacancy.
Michael Hart.....	8, 10 and 12	1,950	496	408	391	300	20	30
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C. J. Skinner.....	1, 3 and 5	2,423	109	265	340	307	114	187
Robert Pelham, Jr.....	13 and 15	2,024	220	573	310	308	38	72
TOTAL.....		12,464	1,425	2,415	2,006	1,569	308	418

In addition to the above work, the inspectors have devoted considerable time in examining and locating stop boxes, and ordering them exposed to sight, repaired or replaced with new ones as the case required. It necessitates the utmost vigilance to keep the stop-boxes exposed to view. Sidewalks being repaired, new ones built, or change of grade in street, alley or lot, the tendency is to pay little attention to the stop-box, and it is usually covered up, as the majority of water takers can see very little use for it until there is an urgent request for shutting off the water in case of bursted pipes, etc., when they have a forcible reminder of its necessity. Not only that, but during the last year there have been 12,464 places reported to be shut off for non-payment, besides many places for vacancy, showing the need of keeping the stop-boxes in sight at all times. A duty that will always exist will be that of seeing they are kept in proper condition, and as there are thousands of them, and increasing daily, one can readily see that it will require much time and watchfulness on the part of the inspectors in giving them the necessary attention.

The following table shows the total number of taps, with iron and wood pipes, of sizes from $\frac{1}{4}$ to 6 inches.

NUMBER OF SERVICE CONNECTIONS.

SIZE OF CONNECTION.	NO. IN 1892.	ADDED IN 1893.	DISCON- TINUED 1893.	TOTAL JANUARY 1, 1894.
Cast iron, 6-inch diameter.....	3	....	.. .	3
" " 4 " "	63	10	....	73
" " 3 " "	98	9	....	107
" " 2 " "	102	18	....	120
" " 1 " "	9,394	841	14	10,221
" " $\frac{1}{4}$ " "	33,549	1,519	40	35,028
Wood pipe.....	3,409	8	312	3,105
Aggregate.....	46,618	2,405	366	48,657

BOARD OF WATER COMMISSIONERS.

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The following table shows the number of taps made, and the different sizes, in each ward the past year:

	WARDS.															TOTAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
New connections, iron pipes, ½ inch.....	80	9	85	40	44	42	47	55	140	71	112	67	140	126	325	286
New connections, iron pipes, 1 inch.....	77	105	89	47	27	67	5	43	84	98	25	60	82	53	74	55
New connections, iron pipes, 2 inches.....	3	5	...	3	...	4	...	...	...	1	...	1	...	...	1	...
New connections, iron pipes, 3 inches.....	2	1	1	...	...	...	1	2	...	...	...	...	...	2	...	9
New connections, iron pipes, 4 inches.....	3	1	...	1	...	1	2	...	...	1	...	1	...	...	...	10
New connections, wood pipes, ½ inch.....	...	...	3	...	...	...	...	1	...	...	...	...	1	...	...	5
New connections, wood pipes, 1 inch.....	...	...	1	...	...	...	...	2	...	...	...	...	...	...	...	3
TOTALS.....	115	121	79	91	71	114	55	103	174	171	137	129	173	181	400	2,405
Discontinued wood connections, ½ inch.....	...	...	...	...	...	...	...	130	42	42	67	23	...	...	...	304
Discontinued wood connections, 1 inch.....	...	...	...	...	...	...	...	1	2	2	...	3	...	...	...	8
Discontinued iron connections, ½ inch.....	3	3	6	5	3	3	4	5	1	2	...	4	...	1	...	40
Discontinued iron connections, 1 inch.....	4	3	3	4	...	...	...	...	...	...	...	...	...	...	...	14
TOTALS.....	7	6	9	9	3	3	4	136	45	46	67	30	...	1	...	366

Attached to this report are complete lists of tools on hand and an itemized account of material in stock in the Meter and Service Cocks Departments, on the 31st day of December, 1893.

In concluding this report, will say that I have endeavored to conduct the work in the departments over which I have charge, with as much economy as possible, and the employes under my supervision have shown a faithfulness in their work that leads me to believe that the Water Works has received full value for the money expended during the past year.

The uniform kindness shown me and the able assistance given by the Secretary, is appreciated to the fullest extent, and for the kind and considerate treatment of your honorable body throughout the past, I beg to offer my warmest thanks.

All of which is respectfully submitted.

T. R. PUTNAM.

Superintendent Meters and Inspection

REPORT OF CHIEF ENGINEER AT PUMPING WORKS.

DETROIT, January 1, 1894.

To the Board of Water Commissioners:

GENTLEMEN — I have the honor to submit the Engineer's report for the year 1893.

The following table shows the number of gallons of water pumped, and cost of fuel for the years named:

YEAR.	GALLONS OF WATER PUMPED.	COST OF FUEL CONSUMED.	AVERAGE DAILY DELIVERED.
1852	235,540,271		646,411
1853	303,521,743	\$2,129 57	931,594
1854	376,493,726	2,271 34	1,030,846
1855	542,807,304	3,325 81	1,487,143
1856	699,124,305	4,017 44	1,896,231
1857	697,190,523	3,9 8 20	1,900,837
1858	718,091,377	3,555 20	1,967,373
1859	782,112,587	3,194 15	2,142,774
1860	870,086,451	4,196 21	2,394,550
1861	805,129,423	4,414 07	2,452,409
1862	904,045,320	3,150 95	2,725,878
1863	1,035,795,013	4,670 86	2,837,808
1864	1,018,390,256	7,647 62	2,839,078
1865	1,040,514,887	7,372 80	2,875,383
1866	1,198,317,022	9,349 16	3,277,583
1867	1,425,535,230	10,121 82	3,905,576
1868	1,606,545,125	11,379 23	4,507,218
1869	1,948,810,325	11,247 92	4,511,809
1870	1,866,060,708	12,713 78	5,112,498
1871	2,300,150,605	14,681 05	6,301,782
1872	2,782,253,578	17,736 86	7,601,892
1873	3,168,393,948	20,233 30	8,782,723
1874	3,299,872,635	20,431 71	9,014,350
1875	4,207,454,260	21,393 98	11,527,272
1876	4,065,174,470	19,832 89	11,107,499
1877	4,373,339,730	17,433 72	11,543,123
1878	4,345,743,330	10,943 82	11,906,146
1879	5,120,599,110	11,219 51	14,054,696
1880	5,552,065,310	12,278 60	15,172,096
1881	6,343,127,068	16,556 63	17,926,377
1882	6,284,080,742	13,156 16	17,361,440
1883	7,370,327,188	16,495 99	20,217,384
1884	8,570,614,140	19,877 07	23,253,044
1885	9,970,8 9,580	21,341 48	27,317,341
1886	10,556,571,254	20,887 24	29,976,907
1887	13,164,859,968	35,822 83	36,079,166
1888	14,390,166,070	39,568 66	39,397,716
1889	12,875,334,453	34,413 81	35,274,888
1890	12,120,944,532	31,852 40	33,909,067
1891	12,057,261,236	33,826 86	33,083,592
1892	12,476,612,402	31,031 40	34,192,499
1893	13,877,977,808	27,479 93	38,091,555

The following tables show in detail the work done by each engine each month of the year.

ENGINE No. 1.

MONTHS.	Time run.		Revolutions.	Gallons.	Gallons of Oil.	Cost of Oil.	Duty.
	H.	M.					
January	696	...	890,601	502,016,400	63,630	\$954 80	76,311.763
February	673	...	839,190	554,478,120	65,487	1,050 93	81,302.926
March	578	...	990,355	449,469,540	54,363	873 63	78,735.194
April .....	...	...	...	...	...	...	...
May	352	40	110,149	170,510,652	21,155	340 60	76,611.923
June	405	40	195,907	303,109,236	37,513	601 44	78,134.672
July	385	40	251,852	389,896,896	49,300	793 73	76,503.427
August	72	40	47,294	73,211,112	9,180	163 42	77,576.511
September	427	45	211,293	326,189,684	39,630	619 22	79,823.953
October	596	45	304,223	470,952,684	62,530	975 46	72,964.979
November	302	05	147,839	228,843,734	30,514	476 01	71,942.159
December .....	...	...	...	...	...	...	...
Total	4,387	15	2,297,773	3,469,489,056	433,172	\$6,829 73	...

ENGINE No. 2.

MONTHS.	H.	M.	Revolutions.	Gallons.	Gallons of Oil.	Cost of Oil.	Duty.
January	456	...	289,763	407,803,488	51,600	\$774 00	76,311.773
February	673	...	405,470	661,671,160	76,966	1,335 08	81,297.845
March	684	...	336,131	491,316,161	56,325	965 20	77,719.527
April	435	35	306,685	246,765,540	30,112	494 80	77,904.563
May	561	45	351,966	438,793,556	53,822	906 53	76,672.296
June	465	05	361,771	439,927,168	54,130	819 29	77,114.798
July	100	35	59,668	96,006,144	12,124	199 22	76,510.660
August	453	15	243,124	455,298,004	56,782	895 71	77,570.672
September	491	40	262,751	432,598,008	51,305	798 79	79,823.953
October	744	...	386,180	620,397,160	82,440	1,386 47	72,964.979
November	534	...	291,688	354,922,892	47,276	737 40	71,942.159
December	732	45	419,147	529,924,188	45,534	710 33	70,365.128
Total	6,301	40	3,654,808	4,937,796,752	619,335	\$9,789 00	...

ENGINE No. 3.

MONTHS.	H.	M.	Revolutions.	Gallons.	Gallons of Oil.	Cost of Oil.	Duty.
January	296	...	306,900	372,480,000	47,220	\$708 20	76,311.773
February .....	...	...	...	...	...	...	...
March	298	...	151,441	372,563,800	22,913	519 90	78,744.239
April	730	...	410,225	739,405,000	90,115	1,460 85	77,904.563
May	422	...	349,970	449,946,000	55,823	898 75	76,672.296
June	408	...	341,660	434,998,000	53,880	897 46	78,104.681
July	744	...	422,560	780,608,000	96,192	1,546 18	78,503.427
August	744	...	424,046	763,362,000	95,190	1,494 96	77,576.511
September	804	...	384,195	511,551,000	61,963	966 98	79,823.953
October .....	...	...	...	...	...	...	...
November	438	...	232,263	418,071,600	55,794	889 47	71,942.159
December	744	...	416,014	748,925,200	101,180	1,578 49	70,365.128
Total	5,363	...	3,080,273	5,470,601,400	690,220	\$10,881 20	...
Aggregate	16,041	55	8,991,354	13,877,977,808	1,748,730	\$27,479 98	...

Fuel oil consumed	\$27,479 93
Salaries, engineers and firemen.. ..	16,571 59
Consulting engineer.....	1,200 00
Coal for pumping oil.....	72 05
Printing and stationery	24 15
Material: rags, waste, polish, etc.	288 18
“ valves, gaskets, grate bars, etc.....	280 99
Repairs, boilers and machinery.....	185 71
Lubricants.....	251 48
Tools and repairs.....	115 45
Medical attendance (injury by accident in 1892)	20 50
Ice	20 80
Horse, harness and repairs.	57 55
Horse-feed, shoeing, etc.	62 50
Street-car tickets.	10 00
Expense on electric-light plant.....	55 18
	<u>\$46,546 01</u>

Cost per million gallons, \$3.35. Engines No. 1 and 2 were run part of the year with one pump detached.

The tables show that the water pumped during the year is 13,877,977,208 gallons. The total expense for pumping water is \$46,546.01, making cost per million gallons, \$3.35. Our average pressure during the year has been higher than ever before, and the cry of short supply is very seldom heard.

The engines and boilers have had only minor repairs during the year, but the boilers will need some repairs soon; otherwise we are now in fair condition.

It is often necessary to reduce the capacity of the three engines now in operation, at such seasons of the year when the demand is at the minimum. This can only be done by stopping the engines, pumping out the well and disconnecting one of the pumps, at a loss of considerable time and expense, besides leaving the engine in a crippled condition. As a matter of safety and economy, I would recommend putting in a connection between the pumps, with valves so arranged that the engines could be changed from one-half to full capacity without stopping.

We have had nearly two years' experience with crude oil for fuel. It is very convenient, and also economical, as the following facts show: Our daily average for 1898 is 38,021,855 gallons, which nearly equals the daily average for 1888, when the cost for coal was \$39,568.66, whereas this year the cost for oil is \$27,479.93, making a saving of \$12,088.73, which we think is remarkable, considering the fact that we have pumped against a pressure of 125 feet during the warm days of summer, whereas we formerly pumped against only 116 feet. We expect to make a still further reduction the coming year, when our new triple expansion engine is ready for use, which we expect will be the latter part of January. This will add twenty-four million gallons to our maximum daily capacity, which will then be one hundred and two millions.

This engine is considered the most economical pumping engine made, and may be described as follows: Vertical triple expansion high steam cylinder 28 in., intermediate 48 in., 74 in. in diameter, with a stroke of sixty inches. The steam cylinders are steam jacketed and covered with non-conducting material, with black walnut in narrow strips fastened on with nickle-plated bands and screws. The cylinders are fitted with the Reynolds-Corliss valve gear, especially arranged for this type of engine, having independent adjustable cut-offs for each cylinder. There are three pumps located beneath and directly in line with the cylinders. The pump plungers are rigidly connected to the steam piston by means of four steel distance rods, passing directly from the cross-heads to the pump plungers. The pumps are of the single-acting, outside-packed plunger type, each pump having one plunger 36 in. in diameter, 60-in. stroke. The suction pipe is 48 in. and discharge 42 in. in diameter. The condenser is of the jet type. The main shaft 18 in. diameter, journal 16 in. and 24 in. long. There are three cranks, set at angles of 120 degrees apart; two fly wheels, 20 feet in diameter, weighing 25 tons each. Steam will be supplied by four horizontal tubular boilers, 62 in. diameter, 20 feet long, each boiler containing forty-nine 4-in. tubes. The boilers are constructed of the best flange steel, 60,000 pounds tensile

strength, thoroughly braced and stayed to carry a working pressure of 125 pounds per square inch. The boiler fronts are of cast iron. The engine is nearly completed, and I am satisfied will prove a great saving in fuel, and also give us the benefit of higher pressure when needed.

It is very frequently necessary to raise the pressure higher than our stand-pipe, and, as the stand-pipe does not relieve the engines, I would recommend connecting the 30-inch main thereto, through a weighted relief valve, direct to the waste, and discontinue the use of the stand-pipe altogether.

The buildings have recently been painted and striped, greatly improving their appearance. Removing the old wooden shed and using part of our coal shed for a blacksmith shop, horse stable and store room, is a decided improvement.

For fire protection and washing out wells, I would recommend extending the 4-inch water-pipe to the south end of the shed and setting a fire hydrant.

You will notice the duty has fallen off during the cold weather, which may be accounted for by the additional space heated by steam.

Inlet pipe number two has been out of use for some time, being reported in a leaky condition by submarine diver Dwyer. As it is necessary to use three inlets at times, I would recommend having this pipe relaid the coming season.

Respectfully submitted.

URIAH GOULD,
Engineer.

REPORT OF THE SUPERINTENDENT OF GROUNDS.

To the Honorable the Board of Water Commissioners:

GENTLEMEN—In submitting my report for the year 1893, I wish to say, first, that the Park is rapidly growing in popularity. Visitors, the past season, far outnumber those of former years, and many expressed themselves as delighted with the arrangement of flower beds and the general care of the Park. The greenhouse built in the fall of 1892 has been of great value, enabling us to make a floral display equal to any in the city. When the different improvements begun this season are completed, which we hope will not be later than June 15th, the Hurlbut Park will be one of the most attractive in the city.

The Hurlbut Memorial Gate, with a frontage of one hundred and thirty-two feet, and fifty feet high, is certainly one of the finest structures of stone and iron to be found in this country.

The iron fence along the front, extending back one hundred feet on the east and west lines, adds very much to the appearance of the grounds.

The waterway, or canal, now being cut from the river through what has been heretofore low marsh, so as to leave two small islands, practically reclaims this whole section of the grounds, and, instead of rank growth of flags and stagnant water, we will have a beautiful winding canal, where row-boats may come well up into the Park. When this part of the grounds is properly graded and trees, shrubs and flowers planted, it will be one of the pleasantest parts of the Park.

Removing the unsightly old coal tramway and dock, and sloping the canal bank to the water's edge, changes very much the appearance of this part of the grounds. What has hereto-

fore been a storage place for old pipes, lumber, iron, etc., will be beautiful lawn, walks, trees, shrubs and flowers.

The new addition to our greenhouse will double the former capacity, and give us an opportunity to increase our floral display in keeping with other improvements.

There is now needed a suitable toilet room for ladies, and also a shelter for horses and carriages. Part of the space between the coal sheds could be covered with corrugated iron roof, supported on iron posts, and would make such shelter with very little expense.

The inventory of tools and implements in this department accompany this report.

Very respectfully,

E. A. SCRIBNER,
Superintendent of Grounds.

REPORT OF THE SUPERINTENDENT OF EXTENSIONS.

DETROIT, January 2d, 1894.

To the Board of Water Commissioners:

GENTLEMEN—In accordance with the regulations of your Honorable Body, I have the honor of presenting my annual report, relative to the general condition and progress of the work in this department.

During the year just closed, not less than thirty-two miles of extensions have been made to our pipeage.

It had been, I believe, the desire of your Honorable Body, to make the general expenses of the Works for the year just closed, as light as possible. It would, however, seem from the above mentioned mileage laid, that so far as this department was concerned, it had failed.

It is somewhat difficult to approximate very closely the probable outlay of this branch of the work at the commencement of the year, it being largely governed by the number of calls during the year for extensions.

The calls for extensions for the past season have been more numerous than the times would seem to demand. Should the coming season be one of increased activity, I anticipate no very great abatement to this branch of the work, and from the large amount of unoccupied land in the recently annexed territory, we may expect to receive numerous calls for extensions. The work in this department has compassed nearly 500 points or lines of extensions, the chief of which have been the extension of the Abbott street line of 24-inch main; this was extended on Tenth street to Michigan avenue, and from this point to Vinewood avenue, connecting with the 24-inch main in said avenue. The 16-inch main in Park street was also extended in said street to Columbia street, and in this street

westward to Cass, thence north on Cass to Gilman street, and on Gilman and Cherry streets to Seventh street; from this line a 12-inch main was laid in Sixth street to Bagg street, connecting with the 24-inch in Bagg street.

A line of 10-inch main was laid in the more easterly portion of the city, this line was laid in Meldrum avenue, connecting with the 42-inch main in Jefferson avenue, thence running south to Wight street, and from this point westward to McDougall avenue, thence south to Guoin street, and in this street westward again to Orleans street, connecting with the 10-inch main at this point.

In addition to the foregoing, a few of the lines recommended in last year's annual report by the Fire Department and myself, have in part been complied with. These are as follows: A 10-inch main in State street from the 30-inch in Washington avenue and State street to Cass street, connecting with the 10-inch in Cass street. An 8-inch main in Monroe avenue from Randolph to St. Antoine streets, connecting with all the lines crossing the same. Also an 8-inch main in Elizabeth street, from Cass to Grand River avenues, connecting with the Cass and Grand River avenue mains. A short section of 8-inch was also laid in Forest avenue, from Trumbull to Avery avenues. An 8-inch main was laid in Wabash avenue from the 30-inch in Buchanan street to Lake Shore R. R. A short section of 10-inch was laid in Hamilton Boulevard, from Hazlewood to Bancroft avenues. A section of the proposed 10-inch in St. Aubin avenue was also laid from the 24-inch main in the N. Boulevard to Trombly avenue, and from which a line of 8-inch pipe was laid in Trombly avenue to Russell street. A short section of 8-inch pipe was laid in Oakland avenue from Englewood avenue north to the city limits. A few lines of 6-inch pipe were laid in the following places: Hastings street from the N. Boulevard to Trombly avenue; Piquette avenue from Beaubien to Russell streets; and Adair street from Jefferson avenue to south of Wight street.

In addition to the above, quite a number of special lines of 6-inch were laid.

RECOMMENDATIONS.

I would respectfully recommend that the following lines may be laid for a more general supply and for better fire protection.

Appended are a few locations which I believe are worthy of your prayerful consideration, and which have been greatly overlooked in the anxiety to care for the more business portions of the city. The following are a few of this order :

Second street; from Fort to alley south of Abbott street, distance 900 feet.

Third street; from Fort to Abbott streets, distance about 1,030 feet.

Fifth street; from alley south of Howard to Labrosse streets, distance about 1,125 feet.

Sixth street; from Abbott to alley north of Labrosse street, distance about 825 feet.

Eighth street; from Fort to Baker streets, distance about 2,025 feet.

Trumbull avenue; from Fort to alley south of Abbott street and from Abbott street to Michigan avenue, distance about 2,500 feet.

There are now no water mains within the above-mentioned distances, the supply of water is through the alleys, most of which are 4 inches in diameter. Each of the above-mentioned lines would have a direct connection with the 24-inch main in Abbott street, and a few with the 16-inch main in Fort street.

I again mention the following lines, which appeared in last annual report of recommendations:

Twelfth street, from Howard to Baker streets. This street is densely built up with residence property, and at Howard street are several large manufactories. A larger main should be laid than the one now in use; the present one is only 4 inches. It would greatly improve this section if a line of pipe should be extended along Abbott street from the 24-inch main at Abbott and Tenth streets to Twelfth.

I am still of the opinion that the laying of a 12-inch pipe in Commonwealth avenue from the 30-inch main in Brigham

street to Kirby avenue, is a wise thing to do, as recommended a year ago, and from which the laying of an 8- or 10-inch in Kirby avenue from Grand River to Woodward avenues. This arrangement would make a splendid cross-feed to the intersecting lines, and should it be needed to lay for better fire protection in the immediate streets crossing Commonwealth avenue, this would be an excellent feeder in this locality. The line in Commonwealth avenue is about 3,200 feet, and the one in Kirby avenue would be about 8,500 feet. A similar line to this would be well to consider for the east side, extending to and connecting with the 30-inch main in Collins street.

I would again mention Park street. There is but a 4-inch pipe in this street from Henry to Peterboro, and also in the intervening streets crossing Park street; this street is densely built up and should have better fire protection. This line would have a direct connection with the 24-inch in Bagg street and the 16-inch main at Park and Columbia streets.

John R. street, from Piquette avenue to N. Boulevard. This would connect direct with the 24-inch main in said Boulevard and would cross the tracks of the L. S. & M. S., D. & B. C., G. T. and Belt Line R. R's, insuring an ample supply of water for this very desirable business centre, as well as for efficient fire protection.

There are a number of others which might be added to the above, which were mentioned in the last annual report.

Toledo avenue, from Hubbard avenue to Twenty-fourth street, distance about 1,575 feet. By the laying of this line we should get a direct connection with the 24-inch in Vinewood avenue, and would give a better circulation, curing one or more dead ends, and furnish a better supply for fire protection.

Sullivan avenue, from the N. Boulevard to Baltimore avenue, distance about 750 feet. This would also give a direct supply from the 24-inch main in the said Boulevard, thereby adding greatly to the supply for fire protection and curing dead end at Milwaukee avenue.

Appended is a tabulated statement of the pipeage now in use classified by its diameters and lengths.

PIPEAGE.

The amount of distribution pipe and mains laid and relaid, and iron and wood pipe discontinued during the past season, is as follows: Total iron pipe laid and relaid, $32\frac{418}{100}$ miles, of which 687 feet were relaid and 1368 feet were laid for private use. $1\frac{111}{100}$ miles of wood and $6\frac{244}{100}$ miles of iron pipe were discontinued, making the net increase of the pipeage $24\frac{111}{100}$ miles. This amount added to the measured lines of iron and wood pipe connected with the works, will make the total length $455\frac{111}{100}$ miles, of which $452\frac{444}{100}$ miles are iron and $3\frac{300}{100}$ miles are wood pipe.

Which in detail is as follows:

SIZE OF PIPE IN INCHES.	MEASURED LENGTH IN FEET FOR 1892.	ADDED LENGTH IN FEET FOR 1893.	DISCONTINUED LENGTH IN FEET FOR 1893.	TOTAL LENGTH IN FEET FOR 1893.
45	103	.....	.....	103
42	44,909	218	.....	45,127
36	715	.....	.....	715
30	49,337	.....	.....	49,337
24	75,174	9,687	48	84,813
20	461	.....	.....	461
18	87	.....	.....	87
16	32,319	4,500	42	36,777
12	6,598	1,890	84	8,444
10	104,259	10,846	96	114,509
8	219,095	8,759	7,059	219,795
6	805,571	115,636	3,799	917,408
4	882,406	16,857	17,415	881,848
3	78,307	1,868	8,433	76,742
2	2,820	.....	.....	2,820
Total,	2,251,221	168,751	31,926	2,388,046

TABLE OF PIPEAGE AS ARRANGED BY WARDS.

WARD.	4-IN.	6-IN.	8-IN.	10-IN.	12-IN.	16-IN.	18-IN.	20-IN.	24-IN.	30-IN.	36-IN.	42-IN.	48-IN.	2-IN.	3-IN.	LEAD.	TOTALS.	Feet Discontinued	Feet Added	
First	73,948	50,383	13,101	96,682	1,980	13,841			6,754	3,934		2,349			5,899	1,165	198,795	41	6,092	
Second	50,079	43,376	6,142	16,381	413	7,556			5,913	4,184					8,064		190,907	5,447	9,487	
Third	41,173	33,990	6,158	6,712		2,194			4,548	2,399		1,679			6,146	8,849	108,768	1,412	6,816	
Fourth	66,428	46,865	6,323	976		3,556			5,323	3,253					6,412	1,404	140,440	1,302	11,516	
Fifth	58,669	30,368	8,796	9,730	715	1,082			3,676	2,513		1,749			4,293	5,193	116,716	64	4,526	
Sixth	52,823	32,134	13,413	3,871	1,550	1,565			5,483	2,533					5,382	165	119,019	2,450	4,944	
Seventh	46,180	20,114	15,093	3,576	2,514	745			406	11,255	3,083	1,869			2,583	736	113,114	2,064	5,482	
Eighth	51,364	48,609	18,205	161	43				8,277	2,153					8,180		137,066	3,928	12,421	
Ninth	62,082	63,730	11,449	4,103	1,815				2,433	12,063	715	3,369			7,600	2,630	171,989	1,365	9,695	
Tenth	81,638	79,570	18,612	6,971					10,967	2,443					4,246		204,467	3,032	14,776	
Eleventh	56,414	51,033	5,149	3,696					1,463			3,479			6,776	4,935	132,894	1,753	6,406	
Twelfth	29,145	67,268	16,996	3,951	16	140	87	55	7,003	2,593					3,204		130,458	1,811	8,714	
Thirteenth	61,293	43,759	8,002	2,992					513	7,173		7,519			7,560	41	188,848	5,963	14,878	
Fourteenth	32,900	85,461	17,685	5,241		2,685			11,203	1,013					3,119		160	159,477	24	13,900
Fifteenth	38,591	123,441	32,349	8,674								23,154	103	2,820	134		143	384,409	1,250	17,110
Sixteenth	23,916	89,227	18,317	10,772		3,538									1,718		147,468		13,584	
Outside City Line	3,483	13,300	1,025														17,810		8,404	
Totals in Feet.	831,348,917	406,219,796	114,509	8,444	36,777		87	461	84,813	49,337	715	45,127	103	2,820	76,302	20,121	494,240,661	31,928	166,751	

It is very gratifying to know that the log or wood pipe system is rapidly disappearing. From the table of pipeage we see recorded but a little over three miles now in use; and yet this system of logs laid for the conveyance of water has greatly added to the growth of the city and comfort of its citizens, and from the fact of its slight cost, as compared with the cost of iron pipe of that early day, the out-lying streets and the greatly scattered dwellings could not be reached without a burdensome expense to the water takers.

Our 3-inch iron pipe is also diminishing in length from year to year, giving place to pipe of larger size, and whatever of this size may appear in our reports as being laid, it should be remembered that it is not laid in any public street or alley, but is laid for some minor purpose.

The adoption of this size pipe in the early past was to take the place of the logs, this being the most economic size for the times; and while some of the lines of this size may at this late day seem very small for the streets in which it is laid, these streets were but little built upon, and might well be called suburban localities. The policy of the Board at that time was, that as the city developed in size and wealth it would be better able to lay large mains.

During the past year, 536 water gates have been set and 83 reset; 559 were for street shut-offs and 62 for blow-offs; 55 were taken out. These were taken out either for repairs or to be replaced with larger gates, on lines replacing smaller pipe. The following is a tabulated statement of the kind, size and number of the herein mentioned gates:

TABLE OF NEW GATES SET FOR SHUT-OFFS.

No. of each kind.	NAME OF GATE.	SIZE.	REMARKS.
3	Murdock Valve Company.....	42-in.	Set for Shut-offs.
1	" " "	12-in.	" "
5	" " "	10-in.	" "
11	" " "	8-in.	" "
39	" " "	6-in.	" "
45	" " "	4-in.	" "
6	" " "	3-in.	" "
10	Michigan Brass and Iron Works.....	20-in..	" "
7	" " "	16-in.	" "
5	" " "	12-in.	" "
24	" " "	10-in.	" "
17	" " "	8-in.	" "
268	" " "	6-in.	" "
2	" " "	6-in.	For Blow-offs.
28	" " "	4-in.	" "
65	" " "	4-in.	For Shut offs.
536	Total.		

TABLE OF OLD GATES RESET FOR SHUT AND BLOW-OFFS.

No. of each kind.	NAME OF GATE.	SIZE.	REMARKS.
1	Flower Bros.....	42-in.	Reset Shut-off.
1	Eddy.	24-in.	" "
1	Murdock Valve Company.....	8-in.	" "
13	" " "	4-in.	" "
2	" " "	4-in.	Set for Blow-off.
2	Galvin Bros.....	4-in.	Reset Shut-off.
6	Flower Bros.....	4-in.	" "
5	" "	4-in.	Set for Blow-off.
7	Pittsburgh	4-in.	" "
1	Ludlow	6-in.	" "
6	"	4-in.	" "
85	Total.		

TABLE OF GATES TAKEN OUT.

No. of each kind.	NAME OF GATE.	SIZE.
8	Flower Bros.....	8 in
8	Flower Bros.....	4 in.
1	Flower Bros.....	3 in.
1	Eddy	8 in
1	Eddy	6 in
4	Murdock Valve Company.....	6 in
15	Murdock Valve Company.....	4 in
5	Pittsburgh	4 in
4	Galvin Bros.....	4 in
5	Ludlow	4 in
3	Michigan Brass and Iron Works.....	4 in.

55

There are now 4,867 stop gates in use in the mains and distribution pipes, ranging in sizes from 3 to 42 inches, and, in addition to this number, we have 667 blow-off gates; these are not all located at dead ends, many of which are permanent, set at special points along the lines of pipes.

The appended table gives the length of 3, 4, 6, 8, 12 and 16-inch pipe, and logs which have been replaced with pipe of larger size, in detail, as follows:

SIZE OF PIPE LAID.	SIZE OF PIPE AND LOGS REPLACED.	LENGTH OF PIPE LAID.
4-inch iron pipe.....	3-inch iron pipe.....	24 feet.
6 " " ".....	3 " " ".....	3,084 "
6 " " ".....	4 " " ".....	5,907 "
6 " " ".....	Log pipe.....	5,728 "
8 " " ".....	" ".....	2,407 "
8 " " ".....	4-inch iron pipe.....	2,640 "
8 " " ".....	6 " " ".....	125 "
10 " " ".....	3 " " ".....	325 "
10 " " ".....	4 " " ".....	2,718 "
10 " " ".....	6 " " ".....	2,624 "
12 " " ".....	4 " " ".....	1,650 "
16 " " ".....	4 " " ".....	4,500 "
16 " " ".....	8 " " ".....	38 "
16 " " ".....	12 " " ".....	34 "
16 " " ".....	16 " " ".....	42 "
24 " " ".....	6 " " ".....	1,050 "
24 " " ".....	8 " " ".....	7,021 "
TOTAL.....		39,912 "

There were connected with the water mains 46 hydrants and 15 reservoirs, making the total number now in use 2,338 hydrants and 494 reservoirs.

We have this year done considerable horizontal boring under our asphalt, brick and wood pavements, having a cement concrete foundation, and also under the earth embankments of the railroad tracks. A machine for this purpose was constructed, whereby we have accomplished this work very successfully. The machine is driven by steam power, a small portable engine and boiler doing the work.

The use of this machine has saved much annoyance to the traffic on our busy street crossings, also at the railroad crossing, as would otherwise be had were we to make an open trench as formerly, for our pipe-laying at such points. We have bored for pipe from 6 to 16 inches, the hole being of sufficient size to allow the hub of the pipe to pass freely through the hole, the barrel of the pipe being lagged out to the size of the hub with pine scantling of proper size.

There are quite a number of pipe lines crossing the Chene street 30-inch main that are not as yet connected with the same which it would be well to connect, and a few on the easterly end of the upper 42-inch main in Mack avenue. Quite a number of streets have been opened along these lines since the mains were laid.

REPAIR DEPARTMENT.

This department of the Works has received its usual and efficient attention to the many items of work coming under its care. The foreman and men are deserving of much credit for their efficient services.

I am glad to say that, while there have been quite a few breaks in our pipeage during the past season, only two have occurred in the larger mains. These were promptly met; no serious damage resulting from either of them, other than the bursting of the pipe. The one in the 24-inch main, East Congress street, was found split near its lower side about 4 feet of its length. The defective piece was cut out and a new piece inserted and sleeved up. The one in Vinewood avenue was found ruptured concentric with the axis of the pipe, the ground having settled at this point from the building of a main sewer, which caused the rupture. We were enabled to make repairs without having to shut off the flow of water in the mains—a few pine wedges were driven in the opening and a bolted sleeve leaded in and calked on.

PUMPING WORKS.

Force Mains.—The alterations in the 42-inch mains mentioned in the last annual report, have been made; the arrangement being such that either of the engines can be run in conjunction with or independent of each other, and can be used jointly with either of the two mains, or, with the proposed third main when the same shall be laid.

There is still an apparent need of a further change in the main leading out from No. 3 engine; this would be for a more direct flow through the lower main.

The new engine has been connected with the outlaying force mains. A 42-inch back pressure check valve was set in connection with the said engine and mains.

Conduit.—The building of the brick conduit for the conveyance of water to the above-mentioned engine, was completed early the past season, with all its appendages. The south end, connecting with the west gate and strainer well, and the north end with the suction pipe leading out from said engine, four 48-inch cast-iron curved pipe were required in making the connection.

In closing this report it is only courteous to say that the help in the office of this department has been very efficient. Transmitted with this report are the locations of the pipes and mains, also gates, to January 2, 1894.

Respectfully submitted,

HENRY BRIDGE,
Superintendent of Extensions.

CHANGES IN STREET NAMES, SO FAR AS ASCERTAINED, AND THEIR APPROXIMATE LOCATION.

PRESENT NAME.	FORMER NAME.	
Avery ave.	Morley st.	N. from Lothrop.
Bancroft ave.	Williams ave. and Joy road.	W. from Woodward
Barker ave.	Ferry ave.	E. from McClellan.
Barry st.	Willis ave.	E. from McClellan.
Beaman st.	Sherman st.	W. from Crane
Belvidere ave.	Company and Bolde aves.	E. of McClellan
Bingham st.	Forest ave.	E. from Cadillac.
Blair st.	Palmer ave.	E. from McClellan.
Bradley st.	Mullett st.	W. from Crane
Brock st.	Lincoln ave. and Seventh st.	N. from Lothrop.
Bruce st.	Champlain st.	W. from Crane.
Buhl st.	Canfield ave.	E. from Holcomb
Burlingame ave.	Englewood ave.	W. from Woodward
Calumet ave.	Brigham st.	W. from Third ave.
Canton ave.	Godfrey ave.	N. from Centerline rd
Carleton st.	Forest ave.	E. from McClellan
Carver st.	Commonwealth ave.	N. from Lothrop
Chapin st.	Hendrie and Medbury.	E. from Fischer ave
Clay ave.	Palbster ave.	E. from Woodward.
Conger st.	Piquette ave.	E. from Baldwin
Cook st.	Poplar st.	E. from Welch ave.
Crane ave.	Laclede ave.	N. from Mack
Crary st.	Clinton ave.	W. from Crane
Crosswell st.	Kirby ave.	E. from McClellan.
Dallas st.	Morton st.	E. from Riopelle
Denning st.	Gilbert st.	E. from Scotten
Dillon ave.	Lincoln ave.	N. from Holden.
Douglas st.	Warren ave.	E. from McClellan.
Duncan st.	Milwaukee ave.	E. from Helen
Durand st.	Maple st.	E. & W. from VanDyke
Eldred st.	Chandler st.	W. from Junction
Emmons st.	Julia H. st.	E. from McClellan.
Erskine st.	Calhoun st.	W. from Gratiot.
Fairbanks st.	Lafayette place.	E. from Scotten.
Felch st.	Piquette ave.	E. from McClellan.
Ferry ave.	Kirby ave.	E. from Baldwin
Finley st.	Custer ave.	W. from Jos. Campus
Fischer ave.	Jayne and Richard aves.	N. from Mack
Forest ave.	Garfield ave.	E. from McClellan.
Foster st.	Beaufort ave.	N. from Centerline rd
Gillett st.	Blain and Chandler.	W. from St. Aubin.
Goodwin st.	Hastings st.	N. from Holbrook.
Gordon st.	Warren ave.	E. from Cadillac
Goethe st.	Elm Grove ave.	W. from McClellan
Granger st.	Palmer ave.	E. from Baldwin.
Graves st.	Hanecok ave.	E. from Holcomb.
Greeley st.	Riopelle st.	N. from Reutter
Greenwood ave.	Crawford st.	S. from Boulevard.
Grimmond ave.	Cleveland ave.	W. from Woodward.
Haigh ave.	Bigelow and Andrus.	W. from St. Aubin.
Hamilton Boulevard.	Crawford st.	N. from Boulevard.
Harper ave.	Centerline road and Butler ave.	N. City line
Hecla ave.	Harrison ave.	N. from Merrick ave.
Hendrie ave.	Boulevard	E. from Baldwin.
Holcomb ave.	Ackley ave.	N. from Gratiot.
Homer st.	Agnes ave.	W. from Crane
Houghton st.	Charles J.	E. from Holcomb.

PRESENT NAME.	FORMER NAME.	
Hyde st.	Harper and Trombley aves.	E. from Helen.
Kellogg st.	Baltimore ave.	E. from Baldwin.
Kirby st.	Farnsworth st.	E. from Baldwin.
Kitchell st.	Riopelle st.	N. from Fallister.
Lacade ave.	Parker ave.	W. from Concord.
Ladue st.	Trombley ave.	E. from Baldwin.
Lafayette ave.	Volunteer ave.	W. from McKinstry.
Laferty st.	Paferty place.	Howard to M. C. R. R.
Lambert st.	Piquette and Kanter aves.	E. from Concord.
Leach st.	Croghan st.	W. from Crane.
Lezoult st.	Farnsworth st.	E. from McClellan.
Lincoln ave.	Green ave.	N. from Holden.
Longyear st.	Harper ave.	E. from Helen.
Losing st.	Orleans st.	N. from Fallister.
Mack ave.	Bellair st.	W. from Gratiot.
Marston ave.	Lincoln ave.	W. from St. Aubin.
Mathews st.	Macomb st.	N. from Helen.
Maxwell ave.	Morton ave.	N. from Gratiot.
Merrill st.	Seventh st.	N. from Lothrop.
Miles st.	Trombley ave.	E. from Helen.
Moffatt st.	Frederick st.	E. from Holcomb.
Morley st.	Avery ave.	N. from Lothrop.
Morrow st.	Dequindre st.	N. from Fallister.
Murray st.	Theodore st.	E. from McClellan.
Norvell st.	Canfield ave.	E. from Van Dyke.
Oakland ave.	Jerome ave.	N. from Piquette.
Olney st.	Whitaker ave.	E. from Russell.
Palmer ave.	Ferry ave.	E. from Baldwin.
Parker ave.	Belle Isle ave.	E. of Van Dyke.
Parkman ave.	Irving and Fourth aves.	W. from Woodward.
Phelps st.	Harper ave.	E. from Baldwin.
Philadelphia ave.	Moeller st.	E. from Russell.
Pollard st.	Horton ave.	W. from Jos. Campau.
Ransom st.	Canfield ave.	E. from Cadillac.
Rivard st.	Prospect ave.	N. from Fallister.
Robns ave.	Crane ave.	N. from Mack.
Seward ave.	Fifth ave.	W. from Woodward.
Seyburn ave.	Morross ave.	S. from Gratiot.
Sherwood ave.	Bellevue and Cleveland.	N. from Harper.
Sidney ave.	Whitaker st.	E. from Russell.
Sprague st.	Willis ave.	E. from Van Dyke.
Stanton ave.	Seventeenth st.	N. from Grand River.
Steding ave.	Trumbull ave.	N. from Holden.
Stevens st.	Superior st.	E. from Van Dyke.
Stuart st.	Superior st.	E. & W. from Concord.
Sylvan st.	Gladstone st.	E. from Vinewood.
Sylvester st.	Alexandrine and De Vogelaer.	E. from Van Dyke.
Taylor ave.	Raymond ave.	W. from Woodward.
Thirteenth st.	Laferty st.	S. from Howard.
Toni ave.	Parker st.	E. & W. from VanDyke.
Walbridge st.	Sargent st.	E. from Baldwin.
Webb ave.	Wilkins ave.	W. from Woodward.
Wellington ave.	Reutter st.	E. from Russell.
Whipple st.	Frederick st.	E. from Baldwin.
Wilbur st.	Endicott ave.	E. from Lincoln ave.
Willard st.	Hancock ave.	E. from Van Dyke.
Winer st.	Harper.	E. from McClellan.

PIPEAGE OF THE CITY OF DETROIT,

ALPHABETED BY STREETS, SHOWING THE SIZE OF IRON AND WOOD PIPE
IN USE.

LOCATION.	DIAM. INCHES.	KIND.
A st., Vinewood to Hubbard.....	4	iron
" e. from Scotten 78 ft.....	4	"
Aberle ave., e. from Russell 349 ft.....	4	"
Abbott st., Cass to Tenth.....	24	"
" w. from Third 30 ft.....	6	"
" alley s. of, from Cass to w. line of Lognon farm.....	4	"
" alley s. of, crossing Sixth.....	6	"
" alley n. of, from First to Twelfth.....	4	"
Adair st., the River to Jefferson.....	6	"
Adams ave., John R. to Randolph.....	6	"
" Witherell to Hastings.....	4	"
" alley s. of, from 240 ft. e. of Clifford to Cass.....	4	"
" alley n. of, from Woodward to 100 ft. w. of Cass.....	4	"
Adelaide st., Woodward to Orleans.....	4	"
" e. from Orleans 36 ft.....	18	"
" 36 ft. e. of Orleans to Gratiot.....	10	"
" crossing Gratiot.....	8	"
Agnes ave., E. Boulevard to Field.....	4	"
Albert st., Wesson to Hammond.....	6	"
Alexandrine ave., Woodward to Cass.....	6	"
" Cass to Third.....	4	"
" w. from Fourth 150 ft.....	3	"
" 180 ft. w. of Fourth to Greenwood.....	4	"
" Sixth to Seventh.....	4	"
" Seventh to alley w. of Trumbull.....	6	"
" alley w. of Trumbull to alley w. of Commonwealth..	4	"
" crossing Grand River.....	6	"
" Woodward to Beaubien.....	4	"
" Beaubien to St. Antoine.....	3	"
" St. Antoine to Russell.....	6	"
" crossing St. Antoine w. side.....	4	"
" Russell to alley west of Dubois.....	4	"
" alley w. of Dubois to Chene and crossing Grandy.....	3	"
" w. line of Chene to w. line of Grandy.....	4	"
" McDougall to alley e. of.....	6	"
" alley e. of McDougall to 401 ft. e. of Moran.....	4	"
Alfred st., Woodward to Russell.....	4	"
" Russell to Orleans.....	3	"
" Orleans to Dubois.....	4	"
Alger ave., 16-in. main to e. line of Woodward.....	6	"
" e. from Woodward 514 ft.....	4	"
" Russell to 443 ft. e. of Greeley.....	6	"
Amberst st., w. from Junction 314 ft.....	4	"
" crossing Campbell.....	6	"
Amsterdam st., crossing Woodward w. side and from e. to w. line, Cass.....	4	"
" w. line of Woodward to e. line of Cass.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Ansenation st., e. from Junction 538 ft.....	4	iron
Arthon st., w. from Junction 360 feet.....	4	"
" 360 ft. w. of Junction to 360 ft. west of Campbell.....	6	"
Artietam st., Rivard to 22 ft. w. of McDougall.....	4	"
Antoinette st., crossing Cass and Second.....	1	"
" e. from Second 165 ft.....	3	"
" w. from Twelfth 193 ft.....	4	"
" w. from Wabash 138 ft.....	4	"
" 138 ft. w. of Wabash to Fourteenth.....	6	"
" w. from Fourteenth 223 ft.....	4	"
" 223 ft. w. of Fourteenth to Fifteenth.....	6	"
" crossing Eighteenth, e. side.....	4	"
Arlington pl., Woodward to Cass.....	4	"
Arndt st., Gratiot to 20 ft. e. of alley e. of McDougall.....	6	"
" alley e. of McDougall to Elmwood.....	3	"
" Elmwood to Mt. Elliott.....	4	"
Artillery ave., n. from River st. 515 ft.....	0	"
" crossing Fort, and 78 ft. s. of to n. line of Lafayette.....	6	"
" s. from Dix 477 ft.....	8	"
Ash st., Grand River to alley e. of Trumbull.....	4	"
" alley w. of Trumbull to National.....	6	"
" Harrison to Twelfth.....	4	"
" Twelfth to alley e. of Wabash.....	6	"
" w. from Wabash 148 ft.....	4	"
" crossing Fifteenth and Sixteenth.....	4	"
" Sixteenth to Seventeenth.....	4	"
" Seventeenth to Eighteenth.....	3	"
" e. line of Eighteenth to alley w. of.....	4	"
" e. from Humboldt 166 ft.....	3	"
" Humboldt to Sullivan.....	4	"
" w. from Sullivan 214 ft.....	3	"
" e. from Maybury 250 ft.....	4	"
" e. line of Tillman to Twenty-fourth.....	4	"
" Twenty-seventh to Vinewood.....	4	"
Atkinson ave., 16-in. main to 21 ft. w. of Woodward.....	6	"
Atwater st., Griswold to Shelby.....	3	"
" Griswold to Bates.....	6	"
" Randolph to 215 ft. e. of St. Aubin.....	4	"
" 215 ft. e. of St. Aubin to McDougall.....	6	"
" alley s. of, alley w. of Bates to Randolph.....	4	"
Andrain st. (in line of), Clippert to Michigan Brass and Iron Works, 1,806 ft.....	4	"
Aurelia st., Twelfth to w. line of Thirteenth.....	4	"
Avery ave., crossing Grand River.....	6	"
" alley s. of Lysander to 125 ft. n. of Putnam.....	6	"
" Merrick to 345 ft. n. of Kirby.....	6	"
" s. from Piquette 104 ft.....	6	"
" alley w. of Lysander to Bunclark court.....	6	"
B st., w. from Vinewood 313 ft.....	4	"
Bagg st., Woodward to Fifteenth.....	24	"
" Fifth to e. line of Greenwood.....	3	"
" crossing Greenwood e. side.....	4	"
Bagley ave., Park to Clifford.....	4	"
" alley e. of, from alley n. of Park to Cass.....	4	"
" alley w. of, 230 ft. n. of Clifford to Grand River.....	4	"
Baker st., Seventh to Twenty-fourth.....	8	"

LOCATION.	DIAM. INCHES.	KIND.
Baker st., Seventh to Eighth.....	4	iron
" Twenty-fourth to Vinewood.....	4	"
" crossing Twenty-fifth and Vinewood e. side 29 ft.....	6	"
" Hubbard to Scotten.....	4	"
" alley s. of, Wabash to Fourteenth.....	4	"
Baldwin ave., Jefferson to 119 ft. s. of Waterloo.....	6	"
" Mack to s. line of Warren.....	10	"
" s. of Gratiot 223 ft.....	10	"
" Gratiot to Harper.....	8	"
Baltimore ave., Woodward to w. line of Greenwood.....	4	"
" w. line of Greenwood to Lincoln.....	6	"
" w. from Sullivan 297 ft.....	4	"
" Woodward to w. line of Brush.....	3	"
" crossing Brush w. side 41 ft.....	6	"
Bancroft ave., 16-in. main to w. line of Woodward.....	6	"
Bates st., Atwater to Farmer.....	6	"
" Congress to Champlain.....	20	"
Beacon st., Brush to 211 ft. e. of St. Antoine.....	4	"
Beals ave., s. from Mack 1,623 ft.....	6	"
Beaman st., Crane to alley w. of.....	4	"
Beaubien st., Atwater to Clinton.....	4	"
" crossing Champlain and Gratiot.....	4	"
" Clinton to Watson.....	4	"
" Watson to Harper.....	10	"
" Harper to s. line of N. Boulevard.....	6	"
" s. to n. line of N. Boulevard.....	10	"
" s. from Custer 112 ft.....	6	"
Beaufait ave., n. from Jefferson 535 ft.....	4	"
" 535 ft. n. of Jefferson to 292 ft. n. of St. Paul.....	4	"
" 292 ft. n. of St. Paul to 263 ft. n. of Kercheval.....	6	"
" Mack to 295 ft. s. of Gratiot.....	6	"
" Gratiot to 190 ft. n. of Forest.....	6	"
" crossing N. Boulevard.....	6	"
Beaver st., Twenty-seventh to Vinewood.....	4	"
Beech st., First to Seventh.....	4	"
Bellevue ave., Jefferson to s. line of Superior.....	6	"
" crossing Gratiot.....	6	"
" Gratiot to 30 ft. s. of Farnsworth.....	4	"
" crossing N. Boulevard.....	8	"
Belmont ave., 16-in. main to e. line of Woodward.....	6	"
Belvidere ave., 67 ft. s. of, to 535 ft. n. of Lorman.....	6	"
Benton st., Brush to Russell.....	4	"
Berlin st., Gratiot to Jos. Campau.....	3	"
" Jos. Campau to alley w. of McDougall.....	6	"
" crossing Jos. Campau and Elmwood.....	4	"
" alley e. of McDougall to Elmwood.....	3	"
" Ellery to Mt. Elliott.....	4	"
Bethune ave., Woodward to Hamilton Boulevard.....	6	"
Biddle st., Twenty-seventh to 190 ft. e. of Vinewood.....	4	"
Blaine ave., 16-in. main to w. line of Woodward.....	6	"
" w. from Woodward 1,616 ft.....	4	"
Boone st., crossing Collins.....	6	"
" w. from Collins 314 ft.....	4	"
" w. from Moran 384 ft.....	4	"
" crossing E. Boulevard e. side 31 ft.....	6	"
Boston Boulevard, crossing Woodward e. from 16-in. main.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Boulevard East (e. side), 255 ft. s. of Jefferson to Congress.....	6	iron.
" (w. side), s. from 42-in. main in Jefferson 94 ft.....	10	"
" (e. side), s. from Agnes 121 ft.....	6	"
" (w. side), Jefferson ave. main to n. line.....	6	"
" (w. side), n. from St. Paul 52 ft.....	6	"
" just s. of Mack crossing E. Boulevard 76 ft.....	6	"
" (e. and w. sides), from Mack ave. main to the n. line....	4	"
" (e. side), s. of Gratiot 29 ft.....	4	"
" (e. side), n. of Gratiot 53 ft.....	6	"
" (w. side), s. of Gratiot 37 ft.....	6	"
" (w. side), n. of Gratiot 48 ft.....	6	"
" (w. side), crossing Farnsworth, Ferry and N. Boulevard	8	"
" (e. side), crossing Farnsworth and N. Boulevard.....	6	"
Boulevard North (n side), crossing Frontenac	8	"
" (both sides), crossing Helen, Canton and Concord....	6	"
" (both sides), crossing Bellevue, Beaufait and Meldrum	6	"
" (both sides), crossing Mt. Elliott, Ellery and Moran...	6	"
" (both sides), crossing Collins.....	6	"
Boulevard East (both sides), crossing Henry, Medbury and Piquette....	6	"
" (e. side), crossing Harper, Boone and Kanter.....	6	"
Boulevard North, Collins to Grand River	24	"
" e. from Mitchell 68 ft.....	4	"
" Grand River to 14 ft. w. of West Boulevard.....	16	"
" (s. side), Woodward to 100 ft. e. of Rivard.....	4	"
" (n. side), crossing Woodward.....	6	"
" w. from Eighteenth 228 ft.....	6	"
" (n. side), e. from Grand River 600 ft.....	4	"
" (s. side), crossing Cass and Fourteenth.....	4	"
" (s. side), crossing Greenwood e. side.....	4	"
" (both sides), crossing Eighteenth.....	4	"
" (s. side), from e. line to 361 ft. w. of Twelfth.....	4	"
" (s. side), from e. line of Grand River to e. side of W. Boulevard.....	4	"
Boulevard West (e. side), s. from N. Boulevard 161 ft	4	"
" (e. side), from 161 ft. s. of N. Boulevard to s. line of Scovel pl.....	6	"
" (w. side), s. from N. Boulevard 117 ft.....	6	"
" (w. side), 430 ft. n. of Warren to 650 ft. s. of same....	6	"
" (both sides), crossing Scovel, Moore and Wreford.....	6	"
" (both sides), crossing McGraw, Hancock and Buchanan	6	"
" (e. side), McGraw to Warren, n. line.....	6	"
" (e. side), crossing Warren.....	4	"
" (e. side), Hancock to Buchanan.....	6	"
" alley e. of Twenty-Seventh to Hubbard.....	6	"
" Myrtle to Michigan.....	6	"
" crossing Michigan.....	6	"
" (w. side), s. from Michigan 444 ft.....	4	"
" (w. side), from n. line of Toledo to n. line of Dix.....	4	"
" (e. side), 196 ft. n. of Toledo to Baker.....	6	"
" (w. side), Baker to Shady lane.....	3	"
" (both sides), Shady lane to Fort.....	4	"
Down ave., Jefferson to 50 ft. s. of Chapaton.....	6	"
Bradley st., w. from Crane 211 ft.....	4	"
Brady st., Woodward to Beaubien.....	6	"
" Beaubien to Russell.....	4	"
Brinard st., Cass to Third.....	4	"

LOCATION.	DIAM. INCHES.	FROM
Brainard st., Third to Fourth.....	6	from
" Fourth to alley w. of.....	4	"
" alley w. of Fourth to Greenwood.....	3	"
" Sixth to Seventh.....	4	"
" e. line of Seventh to Trumbull.....	6	"
Brandon ave., Hubbard to Junction.....	4	"
" Junction to Campbell.....	6	"
Bratahaw st., Third to Fourth.....	6	"
Breckenridge st., w. from Fourteenth 140 ft.....	4	"
" 140 ft. w. of Fourteenth to Fifteenth.....	6	"
" w. from Sixteenth 148 ft.....	6	"
" 148 ft. w. of Sixteenth to Eighteenth.....	4	"
" Eighteenth to Humboldt.....	6	"
" w. from Humboldt 74 ft.....	6	"
Brevoort pl., alley w. of Eighteenth to Nineteenth.....	4	"
" Twenty-second to alley e. of.....	6	"
Brewster st., Brush to Russell and Ropelle to Gratiot.....	4	"
Bristol pl., Twenty-first to Twenty-second.....	4	"
Bruce st., w. from Crane 238 ft.....	4	"
Brush st., Atwater to Jefferson.....	6	"
" crossing Jefferson.....	4	"
" Jefferson to Congress.....	4	"
" Congress to Gratiot.....	4	"
" Gratiot to Wilkins and crossing Eliot and Rowena.....	4	"
" Edmund to Watson.....	24	"
" Watson to Benton.....	6	"
" (both sides), crossing Palmer.....	4	"
" Alexandrine to 230 ft. n. of Milwaukee.....	6	"
" 230 ft. n. of Milwaukee to 34-inch main in N. Boulevard.....	3	"
" Horton to Hamlin.....	4	"
" crossing Chandler.....	6	"
Bryant st., Twelfth to 125 ft. e. of Wabash.....	4	"
" e. from Wabash 125 ft.....	6	"
Buchanan st., Grand River to Vinewood.....	30	"
" Vinewood to Livernois.....	16	"
" Wabash to Fifteenth.....	4	"
" w. from Seventeenth 160 ft.....	4	"
" Eighteenth to 387 ft. w. of Humboldt.....	4	"
" 75 ft. e. of Sullivan to e. line of Maybury.....	3	"
" e. line of Maybury to Williams.....	4	"
" Twenty-third to w. line of Twenty-fourth.....	4	"
" Scotten to Twenty-eighth.....	4	"
" alley s. of Joe to Howell.....	6	"
Bunclark court, Twelfth to alley w. of Avery.....	6	"
Burlage pl., Waterloo to Cleveland.....	8	"
Bushy st., Michigan to Julia.....	6	"
Butternut st., Seventh to alley e. of Trumbull.....	4	"
" alley w. of Trumbull to National.....	4	"
" e. from Wabash 263 ft.....	4	"
" e. from Seventeenth 144 ft.....	4	"
" 227 ft. e. of Maybury to Williams.....	4	"
" Fifteenth to Twenty fourth.....	24	"
C st., Vinewood to Hubbard.....	4	"
Cadillac ave., Pumping Works to Mack.....	42	"
" crossing Jefferson to n. line.....	6	"
" 1,000 ft. n. of. to 2,050 ft. n. of Jefferson.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Cadillac ave., s. from Harper 95 ft.....	6	iron.
Cadillac square (s. side), Woodward to Randolph.....	24	"
" (n. side), Monroe to Bates.....	6	"
" alley n. of, alley w. of Bates to Randolph.....	4	"
Calumet ave., Third to Grand River.....	30	"
" Fourth to Eighth and crossing Lincoln.....	4	"
" w. line to 196 ft. e. of Twelfth.....	4	"
Calvert ave., crossing Woodward to w. side.....	6	"
Cameron ave., 24-inch main to 133 ft. n. of N. Boulevard.....	6	"
" 133 ft. n. of N. Boulevard to Clay.....	4	"
" Clay to 23 ft. n. of Koch.....	6	"
Campau st., River st. to Fort.....	6	"
" n. from Dix 448 ft.....	4	"
Campbell ave., River st. to Porter.....	6	"
" s. line of Dix to Dunn.....	6	"
" Jackson to 161 ft. n. of Herbert.....	6	"
Canfield ave., Woodward to Third.....	30	"
" Woodward to Third.....	4	"
" Fourth to Greenwood.....	4	"
" Sixth to e. line of Seventh.....	3	"
" crossing Seventh.....	4	"
" Twelfth to 48 ft. e. of Thirteenth.....	3	"
" e. from Thirteenth 48 ft.....	4	"
" Woodward to Collins.....	42	"
" Woodward to 767 ft. w. of Mt. Elliott.....	6	"
" w. from Mt. Elliott 767 ft.....	4	"
" Canton to 9 ft. w. of Helen.....	6	"
" alley s. of, e. from Hastings 331 ft.....	3	"
" alley n. of, e. from Hastings 335 ft.....	3	"
" alley n. of, e. from Second 150 ft.....	3	"
Caniff ave., 16-in. main to w. line of Woodward.....	6	"
" w. from Woodward 27 ft.....	4	"
Canton ave., Jefferson to 210 ft. n. of Kercheval.....	6	"
" crossing Mack and s. from Gratiot 1,052 ft.....	6	"
" 63 ft. n. of Hancock to 168 ft. n. of Frederick.....	6	"
" crossing N. Boulevard and s. from Piquette 266 ft.....	6	"
Caroline st., w. from Twelfth 192 ft.....	3 & 4	"
" 192 ft. w. of Twelfth to Thirteenth.....	6	"
Cass st., Woodbridge to Jefferson.....	8	"
" Jefferson to Fort.....	24	"
" alley n. of Michigan to Spencer.....	4	"
" alley w. of, Spencer to Lewis.....	4	"
" alley w. of, from alley n. of Adams to 119 ft. s. of Gilman.....	4	"
" alley w. of, s. from Gilman 119 ft.....	3	"
Cass ave., Jefferson to Columbia and Gilman to Joy.....	10	"
" Columbia to Gilman.....	16	"
" Joy to Alexandrine and crossing Canfield.....	8	"
" Alexandrine to 118 ft. s. of D. & B. C. R. R.....	6	"
" 118 ft. s. of D. & B. C. R. R. to Milwaukee.....	8	"
" s. line of N. Boulevard to 24-in. main.....	8	"
" w. side, crossing Forest and Putnam.....	4	"
" alley w. of, Ledyard to Bagg.....	4	"
Catherine st., Gratiot to Rivard.....	4	"
" crossing Rivard.....	6	"
" Rivard to Dequindre.....	4	"
" Dequindre to St. Aubin.....	3	"
" St. Aubin to Elmwood.....	4	"
Cavalry ave., 416 ft. s. of Cadet to n. line of Dix.....	6	"

LOCATION.	DIAM. INCHES.	REMARKS.
Cavalry ave., n. line of Dix to Toledo.....	4	from
Celeron st., Junction to 274 ft. w. of Campbell.....	4	"
Celia st., Twelfth to Thirteenth.....	4	"
" Thirteenth to 4 ft. e. of Wabash.....	3	"
" Wabash to 4 ft. e. of e. line.....	4	"
Champlain st., Randolph to St. Aubin.....	30	"
" Randolph to alley e. of.....	4	"
" St. Antoine to Orleans.....	4	"
" Orleans to Elmwood.....	6	"
" Elmwood to 250 ft. w. of Lieb.....	4	"
" w. from Lieb 250 ft.....	3	"
" Lieb to Field.....	4	"
" crossing E. Boulevard.....	6	"
" Field to e. line of Baldwin.....	6	"
" Seyburn to Shipperd.....	6	"
" alley n. of, Brush to St. Antoine.....	4	"
Chandler ave., Woodward to w. line of Oakland.....	6	"
Charles st., Sixth to Seventh.....	4	"
Charlevoix st., Chene to e. line of Jos. Campau.....	4	"
" Jos. Campau to alley w. of McDougall.....	3	"
" alley e. of McDougall to Elmwood.....	4	"
" Ellery to Mt. Elliott and w. from Concord 142 ft.....	4	"
Charlotte ave., Woodward to alley e. of Third.....	4	"
" w. from Fourth 131 ft.....	3	"
" 131 ft. w. of Fourth to Fifth.....	4	"
Chase st., e. line of Russell to w. line of Riopelle.....	3	"
" crossing Russell e. side and Riopelle w. side.....	4	"
Chene st., Congress to Canfield.....	30	"
" Atwater to s. line of N. Boulevard.....	6	"
Cherry st., Grand River to Seventh.....	16	"
" Seventh to alley w. of Trumbull.....	4	"
" alley w. of Trumbull to National.....	3	"
" Harrison to Twelfth.....	4	"
Chestnut st., Russell to Elmwood.....	4	"
Chipman st., alley w. of Eighteenth to Nineteenth.....	4	"
Chicago Boulevard, crossing Woodward from 16-inch main to e. line.....	6	"
Chope pl., s. from Grand River 167 ft.....	4	"
" 167 ft. s. of Grand River to Twenty-fourth.....	6	"
Christiancy st., e. from Lansing 134 ft.....	4	"
" w. from Ferdinand 135 ft.....	6	"
Church st., crossing Tenth to 170 ft. w.....	4	"
" crossing Eleventh.....	4	"
" alley s. of Eighth to Tenth.....	4	"
Clairmont ave., 16-inch main to w. line of Woodward.....	6	"
" w. from Woodward 1,375 ft.....	4	"
" w. from Hamilton Boulevard 175 ft.....	6	"
Clark ave., River st. to s. line of M. C. R. R.....	8	"
" s. line of M. C. R. R. to Michigan.....	6	"
" Michigan-Peninsular Car Works to Michigan.....	4	"
" in Car Works' grounds.....	6	"
Clark pk., w. from Scotten 292 ft.....	4	"
" e. from Clark 282 ft.....	4	"
" n. and s. from 4-inch pipe 607 ft.....	3	"
Clay ave., Woodward to Oakland and n. of Clay, crossing Woodward connecting 8 and 16 inch mains.....	8	"
" Oakland to 393 ft. e. of St. Aubin.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Cleveland st., St. Aubin to Elmwood.....	10	Iron.
" Elmwood to Burlage pl.	8	"
Cleveland pl., crossing Greenwood (e. side)....	4	"
" e. from Greenwood 264 ft.....	3	"
" alley n. of, crossing Greenwood (e. side).....	4	"
" alley n. of, from Greenwood to alley w. of Fourth.....	3	"
Clifford st., e. line of Woodward to Washington ..	12	"
" alley w. of Griswold to e. line of Washington ..	4	"
" Park pl. to Sproat.....	4	"
Clinton st., Gratiot to Rivard ..	10	"
" Rivard to Orleans ..	16	"
" and ave., Orleans to Elmwood ..	8	"
Clippert st., n. from Dennis 481 ft.....	4	"
Coe ave., Van Dyke to Parker ..	6	"
Colby ave., crossing Russell (e. side) ..	4	"
Collins st., Gratiot to Canfield.....	42	"
" Canfield to Griffin.....	30	"
" Leland to Canfield ..	4	"
" n. from Canfield 543 ft.....	3	"
" 563 ft. n. of Canfield to 26 ft. n. of Hancock.....	4	"
" s. from Harper 150 ft.	6	"
Columbia st., Woodward to Park.....	4	"
" Park to Cass.....	16	"
" Woodward to John R.	6	"
" John R. to Beaubien ..	4	"
" Beaubien to Rivard.	6	"
" alley s. of, Woodward to Cass.....	6	"
Columbus ave., s. from Fort 570 ft.....	3	"
" crossing Fort.....	4	"
Commonwealth ave. (w. side), Alexandrine to Calumet and crossing Grand River.....	6	"
" crossing Forest 43 ft.	12	"
" (both sides), n. to s. line of Hancock... ..	6	"
" s. line to 168 ft. n. of Putnam.....	6	"
" Kirby to 7 ft. n. of Stanley.....	6	"
" 439 ft. s. of Piquette to Holden.....	6	"
Concord ave., Jefferson to 110 ft. n. of Waterloo.....	6	"
" 330 ft. s. of Charlevoix to Mack.....	6	"
" Sylvester to s. line of Harper.....	6	"
Congress st., Bates to Sixth.....	30	"
" Randolph to St. Aubin.....	24	"
" St. Aubin to Meldrum.....	42	"
" Bates to Brush.....	4	"
" St. Antoine to Mt. Elliott.....	4	"
" w. from Helen 171 ft.....	4	"
" e. side of E. Boulevard to Field ..	4	"
" alley s. of, from Griswold to Third.....	4	"
" alley s. of, e. from Fourth 250 ft.	4	"
" alley s. of, Sixth to Seventh.....	4	"
" alley s. of, 80 ft. w. of Brush to St. Antoine.....	4	"
" alley n. of, from alley w. of Woodward to Shelby.....	4	"
" alley n. of, Shelby to Cass.....	6	"
" alley n. of, Cass to 10 ft. w. of Third.....	4	"
" alley n. of, Fifth to Seventh.....	8	"
" alley n. of, Seventh to Eighth.....	4	"
" alley n. of, alley e. of Woodward to Bates.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Congress st., alley n. of, alley w. of Brush to St. Antoine.....	4	iron.
" alley n. of, alley e. of Woodward e. 94 ft.....	3	"
Cook st., e. from Welch 239 ft.....	4	"
Cracow pl., w. from Rivard 361 ft.....	6	"
Craig ave., n. from Trombly 373 ft.....	3	"
Crane ave., Jefferson to Mack.....	6	"
Crary st., w. from Crane 211 ft.....	4	"
Cross st., alley n. of, John R. to Randolph.....	4	"
Crystal st., Trembly to Milwaukee.....	4	"
Custer ave., e. from Woodward 298 ft.....	4	"
" e. from John R 307 ft.....	4	"
" 307 ft. e. of John R to Brush.....	6	"
" Brush to Hastings.....	4	"
" e. from Rivard 136 ft.....	4	"
Cutler st., e. from McClellan 451 ft.....	4	"
D st., w. from Vinewood 300 ft.....	4	"
Dalziel st., crossing Twelfth.....	4	"
" Twelfth to Thirteenth.....	3	"
" Foundry to Twenty-second.....	4	"
" Twenty-second to Twenty-third.....	6	"
" Twenty-third to Twenty-fourth.....	4	"
Dane st., crossing Collins e. side.....	6	"
" e. line of Collins to 338 ft. e. of Moran.....	4	"
Davenport st., Woodward to Cass.....	4	"
Davis pl., s. from Theodore 260 ft.....	4	"
Deming st., e. from Scotten 368 ft.....	4	"
Dennis st., Livernois to Clippert.....	4	"
Dequindre st., Woodbridge to Jefferson.....	6	"
" w. side Jay to Waterloo.....	4	"
" e. side Waterloo to Gratiot.....	4	"
" s. from Adelaide 306 ft.....	4	"
" Alfred to Pierce.....	4	"
" Canfield to Willis.....	4	"
Detloff ct., crossing Hancock, n. side.....	4	"
" n. line of Hancock to 270 ft. n.....	3	"
Devereaux st., Thirtieth to Thirty-first.....	6	"
Dillon ave., n. from Holden 687 ft.....	6	"
Division st., Brush to St. Aubin.....	4	"
Dix ave., crossing Twenty-third.....	6	"
" (n. side), crossing W. Boulevard 130 ft.....	6	"
" Twenty-fourth to Artillery.....	10	"
Dragoon ave., n. from River st. 563 ft.....	6	"
" s. line of Fort to n. line of Dix.....	6	"
Driggs ave., Junction to Campbell.....	4	"
" crossing Campbell (west side).....	6	"
Dry Dock st., Swain to Lady's lane.....	4	"
Dubois st., Atwater to Clinton.....	6	"
" Clinton to Hunt.....	6	"
" Hunt to n. line of Leland.....	6	"
" n. line of Leland to Canfield.....	3	"
" Canfield to 188 ft. n. of Frederick.....	4	"
" 188 ft. n. of Frederick to Ferry.....	6	"
" Ferry to Hendrie.....	4	"
" Hendrie to 100 ft. s. of Medbury.....	6	"
" 100 ft. s. of Medbury to 20 ft. s. of Harper.....	4	"
" 20 ft. s. of Harper to 102 ft. n. of Piquette.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Dubois st., crossing N. Boulevard.....	8	iron.
Duffield st., Woodward to Cass.....	4	"
Dumontier st., e. from Crase 297 ft.....	4	"
" 297 ft. e. of Crane to 336 ft. e.....	6	"
Dunn st., Campbell to Wesson.....	3	"
E st., Vinewood to Hubbard.....	4	"
" Twenty-sixth to e. line of W. Boulevard.....	4	"
Edison ave., 16-inch main to w. line of Woodward.....	6	"
Edmund pl., Woodward to Brush.....	24	"
Eighth st., River st. to alley s. of Fort.....	4	"
" Fort to alley n. of.....	3 1/4	wood.
" Baker to Cherry.....	4	iron.
" Grand River to Calumet.....	8	"
" crossing Calumet s. side 40 ft.....	6	"
" Calumet to Lysander.....	4	"
Eighteenth st., Fort to 50 ft. n. of Linden.....	6	"
" 50 ft. n. of, to 370 ft. n. of Linden.....	3	"
" 370 ft. n. of, to 468 ft. n. of Linden.....	4	"
" 468 ft. n. of Linden to n. line of Buchanan.....	6	"
" n. line of Buchanan to s. line of Hancock.....	4	"
" crossing Hancock (s. side).....	6	"
" Grand River to s. side of N. Boulevard.....	6	"
" crossing N. Boulevard.....	8	"
" n. from N. Boulevard 228 ft.....	6	"
" alley w. of, Brevoort to Webster pl.....	4	"
" alley w. of, St. Clair to Wing pl.....	4	"
" alley w. of, Chipman to Johnson.....	4	"
Eighteenth-and-a-half st., s. from River st. 504 ft.....	3	"
" River st. to Fort.....	4	"
Eleventh st., Leverette to Michigan.....	6	"
Eliot st., Woodward to Riopelle.....	4	"
Elery st., Arndt to Berlin.....	6	"
" Heidelberg to Snyder pl.....	6	"
" Mack to Pulford.....	6	"
" Zender to Gratiot.....	6	"
" crossing N. Boulevard.....	6	"
Elery pl., Forest to Hancock.....	3	"
Elizabeth st., both sides, alley e. of Woodward to 200 ft. w. of Brush....	4	"
" 200 ft. w. of Brush to Hastings.....	4	"
" alley s. of, alley e. of Woodward to Witherell.....	3	"
" Cass to Grand River.....	8	"
Elm st., Seventh to alley e. of Trumbull.....	4	"
" alley w. of Trumbull to National.....	4	"
" National to Harrison.....	6	"
" Harrison to alley e. of Wabash.....	4	"
Elmwood ave., Jefferson to Monroe and Waterloo to Hunt.....	4	"
" Monroe to Maple and Hunt to Gratiot.....	6	"
Emmons st., McClellan to Pennsylvania.....	4	"
Endicott ave., crossing Woodward e. side.....	4	"
Englewood ave., 16-in. main to e. line of Woodward.....	6	"
" e. line of Woodward to w. line of Oakland.....	4	"
" e. from w. line of Oakland 30 ft.....	6	"
Erakine st., Woodward to Russell.....	4	"
" Russell to 159 ft. w. of Riopelle.....	6	"
" w. from Riopelle 159 ft.....	4	"
" Dequindre to w. line of Chene.....	4	"
" w. line of Chene to Grandy.....	8	"

LOCATION.		DIAM. INCHES.	NO.
Shooll ave., w. from Woodward 580 ft.		6	47
Exposition grounds, s. from River at 948 ft.		4	
1 s. e. from Vinewood 140 ft.		4	
Swanwick st., s. from Scotten 384 ft.		4	
Farmer st., Bates to Grattot.		6	
15 ft. s. of to 38 ft. n. of 30 in. main in Grattot.		5	
Farmersouth ave., Woodward to Beaubien and crossing Rivard.		6	
Beaubien to Russell.		6	48
Russell to Grandy and Mitchell to McElbongall.		6	49
crossing Collins.		6	
Collins to Moran.		3 1/2	
w. from Concord 102 ft.		6	
Canton to Helen.		4	
crossing E. Boulevard.		6	
Farrand st., e. from McClellan 513 ft.		6	
Ferdinand st., n. from River st. 975 ft.		4	
s. from Fort 480 ft.		4	
Porter to 140 ft. n. of Christianity.		6	
380 ft. s. of to 309 ft. n. of Dix.		6	
Ferry ave., Woodward to Russell.		4	
Russell to St. Aubin.		6	
St. Aubin to Mitchell.		4	
w. from Collins 60 ft.		6	
w. line of to 84 ft. e. of Collins and crossing E. Boulevard.		4	
w. from Moran 747 ft.		4	
alley s. of, from alley w. of St. Aubin w. 168 ft.		4	
Field ave., Jefferson to 750 ft. n. of Waterloo.		6	
4 ft. s. of Mack to 177 ft. n. of Medbury.		6	
Fifth st., Congress to alley n. of.		6	
alley s. of to alley n. of Lafayette.		4	
Labrosse to alley s. of Michigan.		4	
Michigan to Noble.		4	
both sides of Elton and Crawford parks.		4	
Holsten to 144 ft. s. of Piquette.		4	
alley e. of, Labrosse to alley s. of Michigan.		6	
Fifteenth st., Fort to n. line of Grand River.		6	
Bagg to Buchanan.		26	
n. from Warren 348 ft.		6	
Kirby to Harper and crossing N. Boulevard.		6	
Finley st., w. from Joe. Campus 428 ft.		4	
First st., Front to Jefferson.		4	
Jefferson to alley n. of and crossing Congress.		6	
Woodbridge to Fort.		4	
Fort to Grand River.		6	
alley e. of, from alley n. of Michigan to Spencer.		4	
Fincher ave., Jefferson to 30 ft. n. of Sherman.		6	
n. from Mack 1,405 ft.		6	
Flouren st., Harper to Piquette.		4	
Flouren st., Shipyard to Van Dyke.		4	
Flouren st., crossing Forest n. s.		4	
n. from Forest 200 ft.		4	
Forest ave., Woodward to Cass.		4	
(both sides) Cass to Third.		4	
Fourth to Seventh and crossing Trumbull.		4	
Trumbull to Commonwealth.		4	
Commonwealth to Avery.		6	

LOCATION.	DIAM. INCHES.	KIND.
Forest ave., Avery to 190 ft. w. of Twelfth.....	4	iron.
" 190 ft. w. of Twelfth to Thirteenth.....	6	"
" alley w. of Wabash to Fourteenth.....	6	"
" Woodward to 873 ft. w. of Rivard.....	4	"
" w. from Rivard 873 ft.....	6	"
" Russell to 190 ft. w. of Grandy.....	4	"
" e. line of Grandy to 190 ft. w.....	6	"
" McDougall to e. line of Collins.....	6	"
" Collins to Moran.....	4	"
" Thompson ct. to 124 ft. w. of Ellery pl.....	6	"
" 124 ft. w. of Ellery pl. to Mt. Elliott.....	4	"
" w. from Beaufait 157 ft.....	4	"
" e. from Baldwin 164 ft.....	4	"
" alley n. of, crossing Orleans w. side.....	4	"
" alley n. of, w. line of Orleans to alley e. of Riopelle.....	3	"
Forsyth ave., crossing Baltimore 83 ft. s. side.....	6	"
Fort st., Woodward to Griswold.....	4	"
" Woodward to Seventh.....	16	"
" Seventh to Fourteenth.....	6	"
" Fourteenth to Hoffman.....	8	"
" Hoffman to Twenty-fourth.....	6	"
" Twenty-fourth to w. line of Artillery.....	8	"
" St. Antoine to Meldrum.....	4	"
" w. from Helen 168 ft.....	4	"
" alley n. of, w. from Brush 135 ft.....	4	"
" alley n. of, Brush to St. Antoine.....	4	"
Foundry st., Baker to Michigan.....	6	"
Fourth st., Woodbridge to Larned.....	4	"
" Larned to Congress.....	8	"
" Fort to Grand River.....	6	"
Fourth ave., Grand River to Bagg.....	4	"
" Bagg to Calumet.....	6	"
" Calumet to Holden.....	4	"
" alley w. of, Brainard to alley n. of.....	4	"
" alley w. of, Selden to alley s. of.....	4	"
Fourteenth ave., Fort to Lafayette and Bagg to Grand River.....	8	"
" (w. side), n. from Porter 402 ft.....	4	"
" Lafayette to Bagg.....	10	"
" Grand River to s. line of N. Boulevard.....	6	"
" s. to n. line of N. Boulevard.....	8	"
Fox st., Frank to Alexandrine.....	3 & 4	"
Frank st., Fourth to 114 ft. w. of Sixth.....	4	"
" 114 ft. w. of Sixth to 75 ft. w. of Fox.....	3	"
Franklin st., Randolph to Beaubien.....	4	"
" Beaubien to Orleans.....	6	"
" Orleans to 25 ft. e. of Dequindre.....	4	"
" 25 ft. e. of Dequindre to McDougall.....	6	"
" Walker to Adair and w. from Leib 825 ft.....	4	"
" alleys n. and s. of, McDougall to Walker.....	4	"
Frederick ave., Woodward to 124 ft. e. of Riopelle.....	4	"
" 124 ft. e. of Riopelle to 139 ft. e.....	6	"
" 252 ft. w. of St. Aubin to Jos. Campau.....	4	"
" crossing Collins and e. of Moran 126 ft.....	6	"
" Helen to E. Boulevard.....	4	"
Fremont pl. (alley n. of Willis), Collins to 443 ft. w. of Moran.....	6	"
" w. from Moran 443 ft.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Front st., 170 ft. e. of First to Second.....	4	iron.
" e. from Third 107 ft.....	6	"
" alley n. of, Second to Third.....	4	"
Frontenac ave., crossing n. side of N. Boulevard.....	8	"
" s. from Medbury 93 ft.....	6	"
Galster st., Canfield to Garfield.....	6	"
Garfield ave., Woodward to w. line of Brush farm.....	4	"
" w. line of Brush farm to 10 ft. w. of Brush.....	4	"
" 10 ft. w. of Brush to e. line.....	4	"
" e. line of Brush to 223 ft. w. of Beaubien.....	6	"
" 223 ft. w. of Beaubien to e. line of St. Antoine.....	4	"
" e. line of St. Antoine to 346 ft. w. of Hastings.....	6	"
" w. from Hastings 346 ft.....	3	"
" Hastings to Chene.....	4	"
" Chene to Grandy.....	6	"
" crossing Grandy, and e. from McDougall 218 ft.....	4	"
" crossing Collins and from 213 ft. w. of Moran to 184 ft. w. of Galster.....	6	"
" w. from Moran 213 ft. and w. from Beaufait 182 ft.....	4	"
" alleys n. and s. of, w. from Hastings 374 ft.....	4	"
Gilman st., Cass to Grand River.....	16	"
Gladstone ave., 16-inch main to 803 ft. w. of Woodward.....	6	"
Glynn ct., 16-inch main to w. line of Woodward.....	6	"
" w. from Woodward 300 ft.....	4	"
Goethe st., Orane to Holcomb and e. from McClellan 228 ft.....	4	"
Goldner ave., Michigan to G. T. Ry.....	6	"
Grand River ave., Woodward to Cass.....	8	"
" Cass to Third.....	6	"
" Third to 400 ft. w. of Humboldt.....	8	"
" 400 ft. w. of Humboldt to Vinewood.....	6	"
" Vinewood to N. Boulevard.....	10	"
Grand River ave., N. Boulevard to city limits.....	6	"
" Calumet to Buchanan.....	30	"
" connecting 30-inch and 8-inch mains in Buchanan 23 ft.....	8	"
" (s. side), Second to 56 ft. e. of Cherry.....	4	"
" (n. side), e. from Eighth 110 ft.....	3	"
" alley n. of, 10 ft. w. of Bagley to alley w. of.....	4	"
" alley n. of, Fourth to Union and w. from Lincoln 47 ft.....	4	"
" alley n. of, 47 ft. w. of Lincoln to alley w. of.....	2 1/4	wood.
" alley n. of, Trumbull to alley w. of and Wabash to alley w. of.....	6	iron.
Grandy ave., Gratiot to Pierce.....	8	"
" Pierce to Harper.....	6	"
" n. from Harper 323 ft.....	4	"
" 223 ft. n. of Harper to Chene.....	6	"
Granger st., e. from Baldwin 259 ft.....	6	"
" 259 ft. e. of Baldwin to Van Dyke.....	4	"
Grant ct., n. from Warren 213 ft.....	4	"
Grant st., crossing Twelfth w. side.....	4	"
" Twelfth to Thirteenth.....	3	"
Granville pl., Thirteenth to Wabash e. line.....	3	"
" crossing Wabash to e. line.....	4	"
Gratiot ave., Woodward to Raynor.....	30	"
" Woodward to Brush.....	10	"
" Brush to 64 ft. w. of Sheridan.....	6	"
" 64 ft. w. of Sheridan to 266 ft. w. of Harper.....	6	"

LOCATION.	DIAM. INCHES.	MIND.
Gratiot ave., 266 ft. w. of Harper to Cadillac	6	iron.
" 30-inch main in Mullett to w. line of Rivard s.	10	"
" w. line of Rivard s. to St. Aubin	12	"
Greenwood ave., Bagg to N. Boulevard	6	"
" crossing Calumet	8	"
Griswold st., Detroit River to Atwater	3	"
" Atwater to State	6	"
" s. from 12-inch main in Clifford 60 ft.	10	"
Grummond ave., 16-inch main in Woodward to Hamilton Boulevard....	6	"
Guilloz st., Clay to Sidney	6	"
Guoin st., e. line of Mullett farm to Orleans	4	"
" Orleans to McDougall	10	"
" McDougall to Walker	6	"
Haigh ave., 16-inch main to e. line of Woodward	6	"
" e. from Woodward 158 ft.	4	"
" Russell to 365 ft. e. of Greeley	6	"
Hale st., Riopelle to St. Aubin	6	"
" e. from St. Aubin 275 ft.	4	"
" 275 ft. e. of St. Aubin to Dubois	3	"
" Dubois to Chene	4	"
" Chene to Grandy	3	"
" Grandy to Jos. Campau	6	"
Hamilton ave., Mack to 692 ft. n. of Canfield	6	"
Hamilton Boul., crossing N. Boulevard	10	"
" n. line of N. Boulevard to Blaine	4	"
" Hazelwood to Bancroft	10	"
Hamlin ave., Woodward to Oakland	4	"
Hammond ave., Toledo to s. line of L. S. R. R.	6	"
" 356 ft. s. of Leavitt to 175 ft. n. of Ranspach	6	"
" s. from Horatio 956 ft.	6	"
Hancock ave., w. line of Cass to 112 ft. e. of Riopelle	4	"
" w. from St. Aubin 488 ft.	6	"
" St. Aubin to Dubois	4	"
" 281 ft. w. of Chene to Grandy	4	"
" w. line of Mitchell to McDougall	4	"
" e. from McDougall 281 ft. and crossing Collins	6	"
" e. line of Collins to Detloff ct	4	"
" alley w. of Ellery pl. to alley w. of Mt. Elliott	4	"
" crossing Thrd	6	"
" n. side e. from Thrd 461 ft.	4	"
" s. side e. from Thrd 10 ft.	4	"
" Fourth to Commonwealth	4	"
" Commonwealth to Avery	6	"
" Avery to 130 ft. w. of Thirteenth	4	"
" 130 ft. w. of Thirteenth to w. line of Wabash	6	"
" w. line of Wabash to Fourteenth	3	"
" crossing Fourteenth and Seventeenth to Eighteenth	4	"
" e. from Twenty-third 140 ft.	4	"
" e. line of Twenty-fourth to Twenty-fifth	4	"
" Twenty-sixth to w. line of Vinewood	4	"
" crossing W. Boulevard 165 ft.	6	"
" LaSalle to Scotten	4	"
Hanover ave., crossing Russell e. side	4	"
Harmon ave., 16-in. main to e. line of Woodward	6	"
" e. line of Woodward to Oakland	4	"
Harper ave., Woodward to Russell	4	"

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	LOCATION.	DIAM. INCHES.	KIND.
	W. line of Dubois to 184 ft. e. of Dubois.....	4	iron
	crossing Dubois and 184 ft. e. of Dubois to w. line of Chene.....	6	"
	w. line of Chene to e. line of Mitchell.....	4	"
	crossing E. Boulevard and Collins.....	8	"
	e. line of Collins to 310 ft. e. of Moran.....	6	"
	eastward to Van Dyke.....	6	"
	eastward to Cadillac.....	6	"
	e. line of Twelfth 176 ft.....	4	"
	crossing Fourteenth.....	6	"
	w. line of Fourteenth 134 ft.....	4	"
	14 ft. w. of Fourteenth to Fifteenth.....	6	"
	crossing Michigan.....	12	"
	Michigan to Grand River.....	4	"
	s. line w. of Linden s. to Linden n.	4	"
	Junction to 500 ft. w. of Campbell.....	4	"
	s. line to 16 in. main in Jefferson.....	16	"
	Jefferson to Champlain.....	24	"
	Congress to Clinton.....	6	"
	115 ft. s. of Congress to Fort and Champlain to Monroe.....	3	"
	Canton to Catherine.....	4	"
	crossing Mullett.....	4	"
	Catherine to Watson.....	6	"
	Watson to Canfield.....	10	"
	Canfield to n. line of Warren and crossing Theodore.....	4	"
	Farnsworth to Ferry.....	6	"
	s. line of Medbury to Harper.....	8	"
	Harper to Piquette.....	6	"
	Piquette to s. line of Trombly.....	4	"
	s. line of Trombly to s. line of N. Boulevard.....	6	"
	crossing N. Boulevard.....	8	"
	n. line of N. Boulevard to Custer.....	4	"
	Custer to 153 ft. n. of Clay.....	6	"
	alley w. of, N. Boulevard to Custer.....	3 & 4	"
	Harrison to 151 ft. w. of Twelfth.....	4	"
	156 ft. w. of Twelfth to 96 ft. e. of Thirteenth.....	3	"
	e. from Thirteenth 96 ft.....	4	"
	16 inch main to w. line of Woodward.....	6	"
	w. line of Woodward to 13 ft. w. of e. line Hamilton Boulevard.....	4	"
	e. from 10 inch main in Hamilton Boulevard 38 ft.....	6	"
	crossing Forest (n. side).....	4	"
	Forest to Hancock.....	3	"
	Merrick to 343 ft. n. of Kirby.....	4	"
	147 ft. s. to 149 ft. n. of Piquette.....	6	"
	s. from Milwaukee 129 ft.....	6	"
	st., crossing Jos. Campau.....	4	"
	e. from Jos. Campau 270 ft.....	24	wood
	270 ft. to 445 ft. e. of Jos. Campau ave.....	3	iron
	alley e. of McDougall to w. line of Elmwood.....	7	"
	crossing Elmwood, w. side, 39 ft.....	4	"
	Elmwood to Mt. Elliott.....	6	"
	Jefferson to Monroe and crossing Mack.....	6	"
	Gratiot to 192 ft. n. of Medbury.....	6	"
	St. Aubin to Dubois.....	3	"
	Dubois to alley w. of McDougall.....	4	"
	alley e. of, McDougall to Elmwood.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Hendricks st., e. from Elmwood 324 ft.....	6	iron.
" 48 ft. e. of Ellery to 522 ft. w. of Mt. Elliott.....	6	"
" w. from Mt. Elliott 522 ft.....	4	"
Hendrie ave., Woodward to 550 ft. e. of John R.....	4	"
" crossing Brush and St. Aubin.....	4	"
" e. from Dubois 224 ft.....	6	"
" 224 ft. e. of Dubois to e. line of Chene.....	4	"
" e. from e. line of Chene 148 ft.....	6	"
" 148 ft. e. of Chene to e. line of Grandy.....	4	"
" Mitchell to e. line of McDougall.....	6	"
" e. from Baldwin 264 ft.....	6	"
" 264 ft. e. of Baldwin to Van Dyke.....	4	"
Henrietta ave., crossing Campbell.....	6	"
Henry st., Woodward to Clifford.....	4	"
" Cass to Third.....	6	"
" Third to alley e. of.....	4	"
Herbert st., Scotten to 134 ft. w. of Lovett.....	4	"
Hibbard ave., Jefferson to 202 ft. n. of Brinket.....	6	"
High st., w. line of Third to Beaubien.....	4	"
" Beaubien to w. line of A. Beaubien farm.....	3	"
" w. line of A. Beaubien farm to Russell.....	4	"
" Russell to Riopelle.....	3	"
" Grand River to Third.....	6	"
" w. line of Third to Fourth.....	3	"
" Fourth to alley w. of Trumbull.....	4	"
" alley w. of Trumbull to National.....	3	"
Hoffman st., River st. to Fort.....	8	"
Holborne ave., e. from Mt. Elliott 170 ft.....	4	"
Holbrook ave., 16-inch main to e. line of Woodward.....	6	"
Holcomb ave., Jefferson to Louis.....	6	"
" Goethe to alley s. of Mack.....	6	"
" Gratiot to Harper.....	6	"
Holden ave., Woodward to w. line of Second.....	6	"
" w. line of Second to Third.....	3	wood.
" Third to Fourth.....	4	iron.
" Fourth to Greenwood.....	3	wood.
" crossing Greenwood.....	6	iron.
" Greenwood to Commonwealth.....	4	"
Holden ave., s. from 24-inch main in N. Boulevard 95 ft.....	10	"
Homer st., w. from Crane 215 ft.....	4	"
Hooker ave., n. from Grand River 63 ft. and w. from Eighteenth 596 ft.....	4	"
" 596 ft. w. of Eighteenth to Sullivan.....	6	"
Horatio st., Thirty-second to Thirty-third and Howell to Welch.....	6	"
" Welch to Livernois.....	4	"
Horton ave., Woodward to Oakland.....	4	"
Houghton ave., Holcomb to McClellan.....	4	"
Howard st., Tenth to Twelfth.....	4	"
" w. side M. C. R. R. bridge to Twenty-fourth.....	6	"
" Twenty-fourth to Twenty-fifth.....	4	"
" Scotten to alley e. of.....	4	"
" w. from Junction 943 ft.....	4	"
" crossing Campbell.....	6	"
Howell st., alley s. of, to n. line of Buchanan.....	6	"
" n. from Horatio 680 ft.....	6	"
Hubbard ave., Fort to 335 ft. n. of Brandon.....	6	"
" E st. to Michigan ave.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Hubbard ave., Michigan to Myrtle.....	6	iron.
Hudson ave., crossing Fourth, w. side.....	4	"
" e. line of, to 564 ft. w. of Greenwood.....	4	"
" crossing Fourteenth.....	6	"
" crossing Eighteenth, e. side.....	4	"
" w. from Eighteenth 144 ft.....	6	"
" 144 ft. w. of Eighteenth to w. line of Humboldt.....	4	"
" Maybury to Twenty-third.....	4	"
" w. from Twenty-third 178 ft.....	6	"
" 178 ft. w. of Twenty-third to Twenty-fourth.....	4	"
" Twenty-sixth to e. line of Vinewood.....	4	"
Humboldt ave., Michigan to s. line of D. & B. C. R. R.....	4	"
" crossing Butternut and Buchanan.....	6	"
" s. line Warren to McGraw.....	6	"
Hunt st., Dubois to alley w. of McDougall.....	4	"
" alley e. of McDougall to Elmwood.....	4	"
" 15 ft. e. of Elery to Mt. Elliott.....	4	"
Hurlbut ave., crossing Jefferson to 21 ft. n. of.....	6	"
Huron st., s. from Locust 205 ft.....	3	"
" Locust to Bagg.....	6	"
Illinois st., 212 ft. w. of Beaubien to Russell.....	6	"
" Russell to St. Aubin.....	4	"
" St. Aubin to Grandy, w. line.....	3	"
" crossing Dubois and Chene.....	4	"
" w. line Grandy to Jos. Campau.....	6	"
" e. from McDougall 241 ft.....	3	"
" 241 ft. e. of to 421 ft. e. of McDougall.....	4	"
" w. from Moran 193 ft.....	4	"
Indiana st., Beaubien to Russell.....	4	"
Ingersoll st., e. from Wesson 225 ft.....	4	"
Iron st., Wight to Jefferson.....	6	"
Irving st., Greenwood to Seventh.....	4	"
Ivy pl. s. from Grand River 418 ft.....	6	"
Jackson st., e. line of Scotten to Twenty ninth.....	4	"
" Thirty-fourth to Thirty fifth.....	6	"
Jay st., Riopelle to 44 ft. w. of McDougall.....	4	"
Jefferson ave., Griswold to Orleans.....	10	"
" Second to Hastings.....	16	"
" Dequindre to w. side of Belt line R. R.....	6	"
" e. side Belt line R. R. to McClellan.....	6	"
" McClellan to e. city limits.....	10	"
" e. from e. city limits 741 ft.....	8	"
" Meldrum to pumping works.....	42	"
" Griswold to First.....	8	"
" alley s. of, alley w. of Woodward to alley w. of Griswold.....	4	"
" alley s. of, Shelby to Cass.....	4	"
" alley s. of, alley w. of Bates to Randolph.....	4	"
" alley s. of, Brush to Beaubien.....	8	"
" alley s. of, e. from Beaubien 140 ft.....	4	"
" alley n. of, Woodward to St. Antoine.....	4	"
" alley n. of, alley e. of Griswold to First.....	4	"
" alley n. of, Griswold to Shelby and First to Third.....	8	"
Joe st., Michigan to alley s. of Buchanan.....	6	"
John R. st., Woodward to Miami.....	12	"
" n. s. of Miami to s. side of Madison.....	4	"
" n. s. of Madison to Adams.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
John R st., Columbia to Edmund.....	8	iron.
" Edmund to Erskine and crossing Eliot and Rowena.....	6	"
" Brady to Piquette.....	6	"
" n. from Baltimore 250 ft.....	3	"
" 250 ft. n. of Baltimore to Milwaukee.....	6	"
" crossing Canfield and N. Boulevard.....	8	"
" alley s. of, Custer to Hamlin.....	6	"
Johnson st., alley w. of Eighteenth to Nineteenth.....	4	"
Jones st., Cass to 160 ft. w. of Fifth.....	4	"
" 160 ft. w. of Fifth to Sixth.....	3	"
Jos. Campau ave., Atwater to Clinton and Jay to s. line of Gratiot.....	6	"
" s. line Gratiot to St. Joseph.....	4	"
" St. Joseph to 135 ft. s. of Hancock.....	6	"
" Theodore to Trombly.....	6	"
" Trombly to 250 ft. n. of Milwaukee.....	4	"
" crossing N. Boulevard.....	8	"
" 250 ft. n. of Milwaukee to 10 ft. n. of Denton (on the w.).....	6	"
Josephine ave., 16-inch to e. line Woodward.....	6	"
Joy st., Cass to alley e. of Third.....	4	"
" Fourth to Fifth.....	4	"
Junction ave., River st. to Driggs.....	6	"
" s. line of Wabash R. R. to s. line of Fort.....	6	"
" s. line of Fort to Otis.....	8	"
Kanter ave., crossing Collins and E. Boulevard e. side 31 ft.....	6	"
" 85 ft. w. of Collins to Moran.....	4	"
" w. from Mt. Elliott 181 ft.....	4	"
Kercheval ave., Mt. Elliott to Beaufait.....	4	"
" Field to Baldwin.....	4	"
King ave., 16-inch main to e. line Woodward.....	6	"
Kinsman st., Scotten to Twenty-eighth.....	4	"
Kirby ave., Woodward to w. line of Cass.....	4	"
" 12 ft. e. of, to 180 ft. w. of Fourth.....	4	"
" 180 ft. w. of Fourth to Greenwood.....	3	"
" Greenwood to w. line of Trumbull.....	4	"
" Commonwealth to Avery.....	4	"
" Hecla to 195 ft. w. of Twelfth.....	4	"
" Wabash to Fourteenth.....	6	"
" w. from Fourteenth 126 ft.....	4	"
" 126 ft. w. of Fourteenth to 87 ft. e. of Sixteenth.....	6	"
" 87 ft. e. of Sixteenth to Eighteenth.....	4	"
" crossing Humboldt and w. from Twenty-seventh 247 ft.....	4	"
" crossing Brush and e. side of Woodward 46 ft.....	6	"
" crossing John R. and Grandy.....	4	"
" e. from Russell 216 ft. and St. Aubin to Chene.....	4	"
" crossing Collins and e. from Baldwin 161 ft.....	6	"
" e. from Helen 238 ft.....	4	"
" e. from Baldwin 161 ft.....	6	"
" 161 ft. e. of Baldwin to Van Dyke.....	4	"
Koch. ave., 16-inch main to e. line of Woodward.....	6	"
" e. line of Woodward to w. line of Oakland.....	4	"
" crossing Oakland, w. side, 26 ft.....	6	"
Labrosse st., Fourth to Fifth.....	4	"
" w. from Tenth 430 ft.....	3	"
" 430 ft. w. of Tenth to Twelfth.....	4	"
" alley s. of, Fourth to alley e. of Twelfth.....	4	"
" alley n. of, alley e. of Fifth to Eighth.....	4	"
" alley n. of, Eighth to Tenth.....	3	"

LOCATION.	DIAM. INCHES.	KIND.
Lady's lane, n. from Dry Dock st. 214 ft.	4	iron
Lafayette ave., Griawold to Shelby	4	"
" w. from Tenth 743 ft.	4	"
" 743 ft. w. of Tenth to M. C. R. R. Bridge	3	"
" Twelfth to Fourteenth	4	"
" w. line of Fourteenth to Fifteenth	3	"
" Fifteenth to Seventeenth	4	"
" Twenty-second to alley e. of	4	"
" e. line of Twenty-third to Twenty-fourth	4	"
" e. from Scotten 236 ft.	4	"
" w. from Junction 315 ft. and e. from Dragoon 123 ft.	4	"
" crossing Campbell and Dragoon to Artillery	6	"
" alley s. of, Griawold to Shelby and Wayne to First	6	"
" alley s. of, First to Fourth and Fifth to Tenth	4	"
" alley n. of, Shelby to First and w. from Tenth 323 ft.	4	"
" alley n. of, First to Tenth	6	"
" alley n. of, e. from Fourteenth 190 ft.	3	"
Lafferty pl., Howard to s. side of M. C. R. R.	6	"
Lamble pl., Twenty-first to Twenty-second	6	"
" crossing Twenty-second and e. side Twenty-third 26 ft.	4	"
Lambert st., Concord to Canton	4	"
" e. from Baldwin 215 ft.	6	"
" 235 ft. e. of Baldwin to Van Dyke	4	"
Langley ave., Fourth to 532 ft. w. of Greenwood	4	"
Lanman st., Twenty-ninth to e. side of Vinewood	6	"
" crossing Vinewood, e. side	4	"
Lansing ave., Fort to 151 ft. n. of Christianity	6	"
" 337 ft. s. of Dix to Toledo	6	"
Larned st., Third to Hastings	16	"
" Bates to Brush and St. Antoine to Dequindre	4	"
" Riopelle to St. Aubin	12	"
" St. Aubin to w. line of Elmwood	4	"
" w. line of Elmwood to 743 ft. e. of	6	"
" Leib to Mt. Elliott	4	"
" w. from Helen 155 ft.	4	"
" Woodward to alley w. of and Third to Fourth	4	"
" Fourth to Fifth	4	"
Laska ave., Michigan to n. line of Buchanan	6	"
" 359 ft. s. of to 338 ft. n. of Hancock	6	"
" crossing Warren and s. from McGraw 393 ft.	6	"
Laurisdale ave., w. from Junction 272 ft.	4	"
" crossing Campbell	6	"
Laurel st., Grand River to Wabash	4	"
Leach st., w. from Crane 215 ft.	4	"
Leavitt ave., Wesson to Livernois	4	"
Lechard st., Cass to Third	6	"
Leicester st., 16-in. main to e. line of Woodward	6	"
" e. from Woodward 1,379 ft.	4	"
Leiland st., w. from Beaubien 306 ft. and McDougall to Collins	3	"
" Beaubien to Russell	4	"
" Russell to McDougall	4	"
" 216 ft. w. of Moran to Gratiot	4	"
Leroy pl., n. from Forest 251 ft.	3	"
Leving st., e. from McClellan 158 ft.	4	"
Levinson st., Seventh to Eighth and Tenth to Twelfth	4	"
" alley s. of, Eighth to Tenth	4	"

LOCATION.	DIAM. INCHES.	KIND.
Lewis st., Cass to Fourth.....	4	Iron.
Leib st., Wight to Jefferson.....	6	"
" Jefferson to Champlain.....	4	"
" Champlain to Monroe.....	3	"
Lincoln ave., Grand River to alley n. of.....	4	"
" crossing Calumet n. side 36 ft.....	8	"
" n. line of Calumet to Milwaukee.....	6	"
" crossing N. Boulevard s. side 87 ft.....	6	"
" alley w. of, alley n. of Grand River to s. line of Calumet	4	"
" alley w. of, crossing Calumet s. side 16 ft.....	6	"
Linden st., Harrison to Eighteenth and crossing Humboldt.....	4	"
" alley w. of Humboldt to Maybury.....	4	"
" Tillman to Twenty-fourth.....	4	"
" Twenty-fifth to 26 ft. e. of Twenty-sixth.....	4	"
Livernois ave., Dix to M. C. R. R.....	8	"
" M. C. R. R. to n. city limits.....	10	"
Locust st., Grand River to Fourth.....	6	"
" Fourth to alley e. of Trumbull.....	4	"
" alley w. of Trumbull to 30 ft. e. of National.....	3	"
" e. from National 30 ft. and Harrison to Wabash.....	4	"
Longfellow ave., 16-in. main to w. line of Woodward.....	6	"
Lorman ave., Crane to Belvidere.....	4	"
Lothrop ave., Woodward to Hamilton Boulevard.....	6	"
Louis ave., Crane to Holcomb.....	4	"
Lovett ave., Michigan to n. line of Buchanan.....	6	"
" n. from Rich 912 ft.....	4	"
" 912 ft. n. of Rich to 264 ft. n. of Herbert.....	6	"
" alley w. of, Visger to Jackson.....	6	"
Ludden st., Gratiot to Mt. Elliott.....	4	"
Lutheran cemetery, in the grounds e. from Mt. Elliott 650 ft.....	2	"
Lyman st., Crystal to Orleans.....	4	"
Lyander st., Fourth to Greenwood and Sixth to Seventh.....	3	"
" crossing Sixth w. side and Seventh to Lincoln.....	4	"
" Avery to e. line of Thirteenth.....	4	"
" crossing Thirteenth e. side 21 ft.....	6	"
McArthur st., w. from Twenty-seventh 340 ft.....	4	"
McClellan ave., Jefferson to Marietta.....	6	"
" Marietta to Mack.....	8	"
" s. line of Mack to 144 ft. n. of Emmons.....	10	"
" n. from Gratiot 299 feet.....	8	"
McDougall ave., Atwater to Guoin, and Wight to Clinton.....	6	"
" Guoin to Wight.....	10	"
" Preston to Gratiot and crossing Waterloo, Cleveland and Arndt.....	8	"
" Gratiot to Canfield.....	4	"
" Canfield to 187 ft. n. of Garfield.....	6	"
" 187 ft. n. of Garfield to Forest.....	8	"
" Forest to Hancock.....	6	"
" s. from Farnsworth 170 ft.....	6	"
" n. line of Hendrie to Palmer.....	6	"
" alley w. of, Mullett to Jay and Hendricks to Hunt.....	4	"
" alley w. of, Cleveland to Hendricks and Hunt to Charlevoix.....	3	"
" alley w. of, Charlevoix to Heidelberg.....	4	"
" alley e. of, Mullett to 88 ft. n. of Chestnut.....	4	"
" alley e. of, Waterloo to Preston.....	3	"

LOCATION.	DIAM. INCHES.	KIND.
Front st., 170 ft. e. of First to Second.....	4	iron
" e. from Third 107 ft.....	6	"
" alley n. of, Second to Third.....	4	"
Frontenac ave., crossing n. side of N. Boulevard.....	8	"
" s. from Medbury 93 ft.....	6	"
Galster st., Canfield to Garfield.....	6	"
Garfield ave., Woodward to w. line of Brush farm.....	4	"
" w. line of Brush farm to 10 ft. w. of Brush.....	6	"
" 10 ft. w. of Brush to e. line.....	4	"
" e. line of Brush to 223 ft. w. of Beaubien.....	6	"
" 223 ft. w. of Beaubien to e. line of St. Antoine.....	4	"
" e. line of St. Antoine to 346 ft. w. of Hastings.....	6	"
" w. from Hastings 346 ft.....	3	"
" Hastings to Chene.....	4	"
" Chene to Grandy.....	6	"
" crossing Grandy, and e. from McDougall 218 ft.....	4	"
" crossing Collins and from 213 ft. w. of Moran to 189 ft. w. of Galster.....	6	"
" w. from Moran 213 ft. and w. from Beaufait 182 ft.....	4	"
" alleys n. and s. of, w. from Hastings 374 ft.....	4	"
Gilman st., Cass to Grand River.....	16	"
Gladstone ave., 16-inch main to 808 ft. w. of Woodward.....	6	"
Glynn ct., 16-inch main to w. line of Woodward.....	6	"
" w. from Woodward 300 ft.....	4	"
Goethe st., Orane to Holcomb and e. from McClellan 228 ft.....	4	"
Goldner ave., Michigan to G. T. Ry.....	6	"
Grand River ave., Woodward to Cass.....	8	"
" Cass to Third.....	6	"
" Third to 400 ft. w. of Humboldt.....	8	"
" 400 ft. w. of Humboldt to Vinewood.....	6	"
" Vinewood to N. Boulevard.....	10	"
Grand River ave., N. Boulevard to city limits.....	6	"
" Calumet to Buchanan.....	30	"
" connecting 30-inch and 8-inch mains in Buchanan 23 ft.....	8	"
" (s. side), Second to 56 ft. e. of Cherry.....	4	"
" (n. side), e. from Eighth 110 ft.....	3	"
" alley n. of, 10 ft. w. of Bagley to alley w. of.....	4	"
" alley n. of, Fourth to Union and w. from Lincoln 47 ft.....	4	"
" alley n. of, 47 ft. w. of Lincoln to alley w. of.....	2 1/4	wood.
" alley n. of, Trumbull to alley w. of and Wabash to alley w. of.....	6	iron
Grandy ave., Gratiot to Pierce.....	8	"
" Pierce to Harper.....	6	"
" n. from Harper 322 ft.....	4	"
" 322 ft. n. of Harper to Chene.....	6	"
Granger st., e. from Baldwin 269 ft.....	6	"
" 269 ft. e. of Baldwin to Van Dyke.....	4	"
Grant ct., n. from Warren 313 ft.....	4	"
Grant st., crossing Twelfth w. side.....	4	"
" Twelfth to Thirteenth.....	3	"
Granville pl., Thirteenth to Wabash e. line.....	3	"
" crossing Wabash to e. line.....	4	"
Gratiot ave., Woodward to Raynor.....	30	"
" Woodward to Brush.....	10	"
" Brush to 64 ft. w. of Sheridan.....	6	"
" 64 ft. w. of Sheridan to 306 ft. w. of Harper.....	6	"

LOCATION.	DIAM. INCHES.	MIND.
Gratiot ave., 266 ft. w. of Harper to Cadillac	6	iron.
" 30-inch main in Mullett to w. line of Rivard s.	10	"
" w. line of Rivard s. to St. Aubin	12	"
Greenwood ave., Baggs to N. Boulevard	6	"
" crossing Calumet	8	"
Griswold st., Detroit River to Atwater	8	"
" Atwater to State	6	"
" s. from 12-inch main in Clifford 60 ft.	10	"
Grummond ave., 16-inch main in Woodward to Hamilton Boulevard	6	"
Guiloz st., Clay to Sidney	6	"
Guoin st., e. line of Mullett farm to Orleans	4	"
" Orleans to McDougall	10	"
" McDougall to Walker	6	"
Haigh ave., 16-inch main to e. line of Woodward	6	"
" e. from Woodward 158 ft.	4	"
" Russell to 365 ft. e. of Greeley	6	"
Hale st., Riopelle to St. Aubin	6	"
" e. from St. Aubin 275 ft.	4	"
" 275 ft. e. of St. Aubin to Dubois	3	"
" Dubois to Chene	4	"
" Chene to Grandy	3	"
" Grandy to Jos. Campau	6	"
Hamilton ave., Mack to 692 ft. n. of Canfield	6	"
Hamilton Boul., crossing N. Boulevard	10	"
" n. line of N. Boulevard to Blaine	4	"
" Hazelwood to Bancroft	10	"
Hamlin ave., Woodward to Oakland	4	"
Hammond ave., Toledo to s. line of L. S. R. R.	6	"
" 356 ft. s. of Leavitt to 175 ft. n. of Ranspach	6	"
" s. from Horatio 956 ft.	6	"
Hancock ave., w. line of Cass to 112 ft. e. of Riopelle	4	"
" w. from St. Aubin 488 ft.	6	"
" St. Aubin to Dubois	4	"
" 281 ft. w. of Chene to Grandy	4	"
" w. line of Mitchell to McDougall	4	"
" e. from McDougall 281 ft. and crossing Collins	6	"
" e. line of Collins to Detloff ct	4	"
" alley w. of Ellery pl. to alley w. of Mt. Elliott	4	"
" crossing Third	6	"
" n. side e. from Third 461 ft.	4	"
" s. side e. from Third 10 ft.	4	"
" Fourth to Commonwealth	4	"
" Commonwealth to Avery	6	"
" Avery to 130 ft. w. of Thirteenth	4	"
" 130 ft. w. of Thirteenth to w. line of Wabash	6	"
" w. line of Wabash to Fourteenth	3	"
" crossing Fourteenth and Seventeenth to Eighteenth	4	"
" e. from Twenty-third 140 ft.	4	"
" e. line of Twenty-fourth to Twenty-fifth	4	"
" Twenty-sixth to w. line of Vinewood	4	"
" crossing W. Boulevard 165 ft.	6	"
" LaSalle to Scotten	4	"
Hanover ave., crossing Russell e. side	4	"
Harmon ave., 16-in. main to e. line of Woodward	6	"
" e. line of Woodward to Oakland	4	"
Harper ave., Woodward to Russell	4	"

LOCATION.		DIAM. INCHES.	KIND.
Harper ave.,	Widman pl. to 184 ft. e. of Dubois.....	4	iron
"	crossing Dubois and 184 ft. e. of Dubois to w. line of Chene.....	6	"
"	w. line of Chene to e. line of Mitchell.....	4	"
"	crossing E. Boulevard and Collins.....	8	"
"	e. line of Collins to 310 ft. e. of Moran.....	6	"
"	Baldwin to Van Dyke.....	6	"
"	Gratiot to Cadillac.....	6	"
"	w. from Twelfth 176 ft.	4	"
"	crossing Fourteenth.....	6	"
"	w. from Fourteenth 134 ft.	4	"
"	134 ft. w. of Fourteenth to Fifteenth.....	6	"
Harrison ave.,	crossing Michigan.....	12	"
"	Michigan to Grand River.....	4	"
"	alley w. of, Linden s. to Linden n.	1	"
Harvey ave.,	Junction to 500 ft. w. of Campbell.....	4	"
Hastings st.,	s. line to 16-in. main in Jefferson.....	10	"
"	Jefferson to Champlain.....	24	"
"	Congress to Clinton.....	3	"
"	118 ft. s. of Congress to Fort and Champlain to Monroe.....	6	"
"	Clinton to Catherine.....	4	"
"	crossing Mullett.....	4	"
"	Catherine to Watson.....	6	"
"	Watson to Canfield.....	10	"
"	Canfield to n. line of Warren and crossing Theodore.....	4	"
"	Farnsworth to Ferry.....	6	"
"	s. line of Medbury to Harper.....	8	"
"	Harper to Piquette.....	6	"
"	Piquette to s. line of Trombly.....	4	"
"	s. line of Trombly to s. line of N. Boulevard.....	6	"
"	crossing N. Boulevard.....	4	"
"	n. line of N. Boulevard to Custer.....	8	"
"	Custer to 153 ft. n. of Clay.....	6	"
"	alley w. of, N. Boulevard to Custer.....	3 & 4	"
Hazel st.,	Harrison to 150 ft. w. of Twelfth.....	4	"
"	156 ft. w. of Twelfth to 96 ft. e. of Thirteenth.....	2	"
"	e. from Thirteenth 96 ft.	4	"
Hazelwood ave.,	16-inch main to w. line of Woodward.....	6	"
"	w. line of Woodward to 13 ft. w. of e. line Hamilton Boulevard.....	4	"
"	e. from 10 inch main in Hamilton Boulevard 98 ft.	6	"
Heck pl.,	crossing Forest (n. side).....	4	"
"	Forest to Hancock.....	3	"
Hecla ave.,	Merrick to 343 ft. n. of Kirby.....	4	"
"	147 ft. s. to 149 ft. n. of Piquette.....	6	"
"	s. from Milwaukee 129 ft.	6	"
Heidelberg st.,	crossing Jos. Campau.....	4	"
"	e. from Jos. Campau 270 ft.	24	wood
"	270 ft. to 445 ft. e. of Jos. Campau ave.	3	iron
"	alley e. of McDougall to w. line of Elmwood.....	3	"
"	crossing Elmwood, w. side, 39 ft.	4	"
"	Elmwood to Mt. Elliott.....	6	"
Helen ave.,	Jefferson to Monroe and crossing Mack.....	6	"
"	Gratiot to 192 ft. n. of Medbury.....	6	"
Hendricks st.,	St. Aubin to Dubois.....	3	"
"	Dubois to alley w. of McDougall.....	4	"
"	alley e. of, McDougall to Elmwood.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Hendricks st., e. from Elmwood 324 ft.....	6	Iron.
" 48 ft. e. of Ellery to 522 ft. w. of Mt. Elliott.....	6	"
" w. from Mt. Elliott 522 ft.....	4	"
Hendrie ave., Woodward to 550 ft. e. of John R.....	4	"
" crossing Brush and St. Aubin.....	4	"
" e. from Dubois 224 ft.....	6	"
" 224 ft. e. of Dubois to e. line of Chene.....	4	"
" e. from e. line of Chene 148 ft.....	6	"
" 148 ft. e. of Chene to e. line of Grandy.....	4	"
" Mitchell to e. line of McDougall.....	6	"
" e. from Baldwin 264 ft.....	6	"
" 264 ft. e. of Baldwin to Van Dyke.....	4	"
Henrietta ave., crossing Campbell.....	6	"
Henry st., Woodward to Clifford.....	4	"
" Cass to Third.....	6	"
" Third to alley e. of.....	4	"
Herbert st., Scotten to 134 ft. w. of Lovett.....	4	"
Hibbard ave., Jefferson to 202 ft. n. of Brinket.....	6	"
High st., w. line of Third to Beaubien.....	4	"
" Beaubien to w. line of A. Beaubien farm.....	3	"
" w. line of A. Beaubien farm to Russell.....	4	"
" Russell to Riopelle.....	3	"
" Grand River to Third.....	6	"
" w. line of Third to Fourth.....	3	"
" Fourth to alley w. of Trumbull.....	4	"
" alley w. of Trumbull to National.....	3	"
Hoffman st., River st. to Fort.....	8	"
Holborne ave., e. from Mt. Elliott 170 ft.....	4	"
Holbrook ave., 16-inch main to e. line of Woodward.....	6	"
Holcomb ave., Jefferson to Louis.....	6	"
" Goethe to alley s. of Mack.....	6	"
" Gratiot to Harper.....	6	"
Holden ave., Woodward to w. line of Second.....	6	"
" w. line of Second to Third.....	3	wood.
" Third to Fourth.....	4	iron.
" Fourth to Greenwood.....	3	wood.
" crossing Greenwood.....	6	iron.
" Greenwood to Commonwealth.....	4	"
Holden ave., s. from 24-inch main in N. Boulevard 95 ft.....	10	"
Homer st., w. from Crane 215 ft.....	4	"
Hooker ave., n. from Grand River 63 ft. and w. from Eighteenth 596 ft.....	4	"
" 596 ft. w. of Eighteenth to Sullivan.....	6	"
Horatio st., Thirty-second to Thirty-third and Howell to Welch.....	6	"
" Welch to Livernois.....	4	"
Horton ave., Woodward to Oakland.....	4	"
Houghton ave., Holcomb to McClellan.....	4	"
Howard st., Tenth to Twelfth.....	4	"
" w. side M. C. R. R. bridge to Twenty-fourth.....	6	"
" Twenty-fourth to Twenty-fifth.....	4	"
" Scotten to alley e. of.....	4	"
" w. from Junction 348 ft.....	4	"
" crossing Campbell.....	6	"
Howell st., alley s. of, to n. line of Buchanan.....	6	"
" n. from Horatio 680 ft.....	6	"
Hubbard ave., Fort to 335 ft. n. of Brandon.....	6	"
" E st. to Michigan ave.....	4	"

LOCATION.	DIAM. INCHES.	KING.
Hubbard ave., Michigan to Myrtle.....	6	iron
Hudson ave., crossing Fourth, w. side.....	4	"
" e. line of, to 564 ft. w. of Greenwood.....	4	"
" crossing Fourteenth.....	6	"
" crossing Eighteenth, e. side.....	4	"
" w. from Eighteenth 144 ft.....	6	"
" 144 ft. w. of Eighteenth to w. line of Humboldt.....	4	"
" Maybury to Twenty-third.....	4	"
" w. from Twenty-third 178 ft.....	6	"
" 178 ft. w. of Twenty-third to Twenty-fourth.....	4	"
" Twenty-sixth to e. line of Vinewood.....	4	"
Humboldt ave., Michigan to s. line of D. & B. C. R. R.....	4	"
" crossing Butternut and Buchanan.....	6	"
" s. line Warren to McGraw.....	6	"
Hunt st., Dubois to alley w. of McDougall.....	4	"
" alley e. of McDougall to Elmwood.....	4	"
" 15 ft. e. of Ellery to Mt. Elliott.....	4	"
Hurlbut ave., crossing Jefferson to 21 ft. n. of.....	6	"
Huron st., s. from Locust 295 ft.....	3	"
" Locust to Baggs.....	6	"
Illinois st., 212 ft. w. of Beaubien to Russell.....	6	"
" Russell to St. Aubin.....	4	"
" St. Aubin to Grandy, w. line.....	3	"
" crossing Dubois and Chene.....	4	"
" w. line Granly to Jos. Campau.....	6	"
" e. from McDougall 241 ft.....	3	"
" 241 ft. e. of to 421 ft. e. of McDougall.....	4	"
" w. from Moran 133 ft.....	4	"
Indiana st., Beaubien to Russell.....	4	"
Ingersoll st., e. from Wesson 226 ft.....	4	"
Iron st., Wight to Jefferson.....	6	"
Irving st., Greenwood to Seventh.....	4	"
Ivy pl., s. from Grand River 418 ft.....	6	"
Jackson st., e. line of Scotten to Twenty-ninth.....	4	"
" Thirty-fourth to Thirty-fifth.....	6	"
Jay st., Riopelle to 44 ft. w. of McDougall.....	4	"
Jefferson ave., Griswold to Orleans.....	10	"
" Second to Hastings.....	16	"
" Dequindre to w. side of Belt-line R. R.....	6	"
" e. side Belt-line R. R. to McClellan.....	6	"
" McClellan to e. city limits.....	10	"
" e. from e. city limits 741 ft.....	8	"
" Meldrum to pumping works.....	42	"
" Griswold to First.....	8	"
" alley s. of, alley w. of Woodward to alley w. of Griswold.....	4	"
" alley s. of, Shelby to Cass.....	4	"
" alley s. of, alley w. of Bates to Randolph.....	4	"
" alley s. of, Brush to Beaubien.....	8	"
" alley s. of, e. from Beaubien 190 ft.....	4	"
" alley n. of, Woodward to St. Antoine.....	4	"
" alley n. of, alley e. of Griswold to First.....	4	"
" alley n. of, Griswold to Shelby and First to Third.....	8	"
Joe st., Michigan to alley s. of Buchanan.....	6	"
John R. st., Woodward to Miami.....	12	"
" n. s. of Miami to s. side of Madison.....	4	"
" n. s. of Madison to Adams.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
John R st., Columbia to Edmund.....	8	iron.
“ Edmund to Erskine and crossing Eliot and Rowena.....	6	“
“ Brady to Piquette.....	6	“
“ n. from Baltimore 250 ft.....	3	“
“ 250 ft. n. of Baltimore to Milwaukee.....	6	“
“ crossing Canfield and N. Boulevard.....	8	“
“ alley s. of, Custer to Hamlin.....	6	“
Johnson st., alley w. of Eighteenth to Nineteenth.....	4	“
Jones st., Cass to 160 ft. w. of Fifth.....	4	“
“ 160 ft. w. of Fifth to Sixth.....	3	“
Jos. Campau ave., Atwater to Clinton and Jay to s. line of Gratiot.....	6	“
“ s. line Gratiot to St. Joseph.....	4	“
“ St. Joseph to 135 ft. s. of Hancock.....	6	“
“ Theodore to Trombly.....	6	“
“ Trombly to 250 ft. n. of Milwaukee.....	4	“
“ crossing N. Boulevard.....	8	“
“ 250 ft. n. of Milwaukee to 10 ft. n. of Denton (on the w.).....	6	“
Josephine ave., 16-inch to e. line Woodward.....	6	“
Joy st., Cass to alley e. of Third.....	4	“
“ Fourth to Fifth.....	4	“
Junction ave., River st. to Driggs.....	6	“
“ s. line of Wabash R. R. to s. line of Fort.....	6	“
“ s. line of Fort to Otis.....	8	“
Kanter ave., crossing Collins and E. Boulevard e. side 31 ft.....	6	“
“ 85 ft. w. of Collins to Moran.....	4	“
“ w. from Mt. Elliott 181 ft.....	4	“
Kercheval ave., Mt. Elliott to Beaufait.....	4	“
“ Field to Baldwin.....	4	“
King ave., 16-inch main to e. line Woodward.....	6	“
Kinsman st., Scotten to Twenty-eighth.....	4	“
Kirby ave., Woodward to w. line of Cass.....	4	“
“ 12 ft. e. of, to 180 ft. w. of Fourth.....	3	“
“ 180 ft. w. of Fourth to Greenwood.....	3	“
“ Greenwood to w. line of Trumbull.....	4	“
“ Commonwealth to Avery.....	4	“
“ Hecla to 195 ft. w. of Twelfth.....	4	“
“ Wabash to Fourteenth.....	6	“
“ w. from Fourteenth 126 ft.....	4	“
“ 126 ft. w. of Fourteenth to 87 ft. e. of Sixteenth.....	6	“
“ 87 ft. e. of Sixteenth to Eighteenth.....	4	“
“ crossing Humboldt and w. from Twenty-seventh 247 ft.....	4	“
“ crossing Brush and e. side of Woodward 46 ft.....	6	“
“ crossing John R. and Grandy.....	4	“
“ e. from Russell 216 ft. and St. Aubin to Chene.....	4	“
“ crossing Collins and e. from Baldwin 161 ft.....	6	“
“ e. from Helen 238 ft.....	4	“
“ e. from Baldwin 161 ft.....	6	“
“ 161 ft. e. of Baldwin to Van Dyke.....	4	“
Koch, ave., 16-inch main to e. line of Woodward.....	6	“
“ e. line of Woodward to w. line of Oakland.....	4	“
“ crossing Oakland, w. side, 26 ft.....	6	“
Labrosse st., Fourth to Fifth.....	4	“
“ w. from Tenth 430 ft.....	3	“
“ 430 ft. w. of Tenth to Twelfth.....	4	“
“ alley s. of, Fourth to alley e. of Twelfth.....	4	“
“ alley n. of, alley e. of Fifth to Eighth.....	4	“
“ alley n. of, Eighth to Tenth.....	3	“

LOCATION.	DIAM. INCHES.	KIND.
Lady's lane, n. from Dry Dock st. 214 ft.....	4	iron.
Lafayette ave., Griswold to Shelby.....	4	"
" w. from Tenth 743 ft.....	4	"
" 743 ft. w. of Tenth to M. C. R. R. Bridge.....	3	"
" Twelfth to Fourteenth.....	4	"
" w. line of Fourteenth to Fifteenth.....	3	"
" Fifteenth to Seventeenth.....	4	"
" Twenty-second to alley e. of.....	4	"
" e. line of Twenty-third to Twenty-fourth.....	4	"
" e. from Scotten 256 ft.....	4	"
" w. from Junction 315 ft. and e. from Dragoon 123 ft.....	4	"
" crossing Campbell and Dragoon to Artillery.....	6	"
" alley s. of, Griswold to Shelby and Wayne to First.....	6	"
" alley s. of, First to Fourth and Fifth to Tenth.....	4	"
" alley n. of, Shelby to First and w. from Tenth 323 ft.....	4	"
" alley n. of, First to Tenth.....	6	"
" alley n. of, e. from Fourteenth 190 ft.....	3	"
Lafferty pl., Howard to s. side of M. C. R. R.....	6	"
Lamble pl., Twenty-first to Twenty-second.....	6	"
" crossing Twenty-second and e. side Twenty-third 26 ft.....	4	"
Lambert st., Concord to Canton.....	4	"
" e. from Baldwin 213 ft.....	6	"
" 235 ft. e. of Baldwin to Van Dyke.....	4	"
Langley ave., Fourth to 592 ft. w. of Greenwood.....	4	"
Langman st., Twenty-seventh to e. side of Vinewood.....	6	"
" crossing Vinewood, e. side.....	4	"
Lansing ave., Fort to 15) ft. n. of Christianity.....	6	"
" 337 ft. s. of Dix to Toledo.....	6	"
Larned st., Third to Hastings.....	16	"
" Bates to Brush and St. Antoine to Dequindre.....	4	"
" Riopelle to St. Aubin.....	12	"
" St. Aubin to w. line of Elmwood.....	4	"
" w. line of Elmwood to 748 ft. e. of.....	6	"
" Leib to Mt. Elliott.....	4	"
" w. from Helen 153 ft.....	4	"
" Woodward to alley w. of and Third to Fourth.....	4	"
" Fourth to Fifth.....	4	"
LaSalle ave., Michigan to n. line of Buchanan.....	6	"
" 339 ft. s. of to 324 ft. n. of Hancock.....	6	"
" crossing Warren and s. from McGraw 395 ft.....	6	"
Laureldale ave., w. from Junction 472 ft.....	4	"
" crossing Campbell.....	6	"
Laurel st., Grand River to Wabash.....	4	"
Leach st., w. from Crane 215 ft.....	4	"
Leavitt ave., Weason to Livernois.....	4	"
Ledyard st., Cass to Third.....	6	"
Leicester ct., 16 in. main to e. line of Woodward.....	6	"
" e. from Woodward 1,379 ft.....	4	"
Leland st., w. from Beaubien 206 ft. and McDougall to Collins.....	3	"
" Beaubien to Russell.....	4	"
" Russell to McDougall.....	4	"
" 216 ft. w. of Moran to Gratiot.....	4	"
Leroy pl., n. from Forest 251 ft.....	3	"
Leasing st., e. from McClellan 158 ft.....	4	"
Leverette st., Seventh to Eighth and Tenth to Twelfth.....	4	"
" alley s. of, Eighth to Tenth.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Lewis st., Cass to Fourth.....	4	iron.
Leib st., Wight to Jefferson.....	6	"
" Jefferson to Champlain.....	4	"
" Champlain to Monroe.....	3	"
Lincoln ave., Grand River to alley n. of.....	4	"
" crossing Calumet n. side 36 ft.....	8	"
" n. line of Calumet to Milwaukee.....	6	"
" crossing N. Boulevard s. side 87 ft.....	6	"
" alley w. of, alley n. of Grand River to s. line of Calumet	4	"
" alley w. of, crossing Calumet s. side 16 ft.....	6	"
Linden st., Harrison to Eighteenth and crossing Humboldt.....	4	"
" alley w. of Humboldt to Maybury.....	4	"
" Tillman to Twenty-fourth.....	4	"
" Twenty-fifth to 26 ft. e. of Twenty-sixth.....	4	"
Livernois ave., Dix to M. C. R. R.....	8	"
" M. C. R. R. to n. city limits.....	10	"
Locust st., Grand River to Fourth.....	6	"
" Fourth to alley e. of Trumbull.....	4	"
" alley w. of Trumbull to 30 ft. e. of National.....	3	"
" e. from National 30 ft. and Harrison to Wabash.....	4	"
Longfellow ave., 16-in. main to w. line of Woodward.....	6	"
Lorman ave., Crane to Belvidere.....	4	"
Lothrop ave., Woodward to Hamilton Boulevard.....	6	"
Louis ave., Crane to Holcomb.....	4	"
Lovett ave., Michigan to n. line of Buchanan.....	6	"
" n. from Rich 912 ft.....	4	"
" 912 ft. n. of Rich to 284 ft. n. of Herbert.....	6	"
" alley w. of, Visger to Jackson.....	6	"
Ludden st., Gratiot to Mt. Elliott.....	4	"
Lutheran cemetery, in the grounds e. from Mt. Elliott 650 ft.....	2	"
Lyman st., Crystal to Orleans.....	4	"
Lyander st., Fourth to Greenwood and Sixth to Seventh.....	3	"
" crossing Sixth w. side and Seventh to Lincoln.....	4	"
" Avery to e. line of Thirteenth.....	4	"
" crossing Thirteenth e. side 21 ft.....	6	"
McArthur st., w. from Twenty-seventh 340 ft.....	4	"
McClellan ave., Jefferson to Marietta.....	6	"
" Marietta to Mack.....	8	"
" s. line of Mack to 144 ft. n. of Emmons.....	10	"
" n. from Gratiot 299 feet.....	8	"
McDougall ave., Atwater to Guoin, and Wight to Clinton.....	6	"
" Guoin to Wight.....	10	"
" Preston to Gratiot and crossing Waterloo, Cleveland and Arndt.....	8	"
" Gratiot to Canfield.....	4	"
" Canfield to 187 ft. n. of Garfield.....	6	"
" 187 ft. n. of Garfield to Forest.....	8	"
" Forest to Hancock.....	6	"
" s. from Farnsworth 170 ft.....	6	"
" n. line of Hendrie to Palmer.....	6	"
" alley w. of, Mullett to Jay and Hendricks to Hunt.....	4	"
" alley w. of, Cleveland to Hendricks and Hunt to Char- levoix.....	3	"
" alley w. of, Charlevoix to Heidelberg.....	4	"
" alley e. of, Mullett to 88 ft. n. of Chestnut.....	4	"
" alley e. of, Waterloo to Preston.....	3	"

LOCATION.	DIAM. INCHES.	KIND.
McDougall ave., alley e. of, crossing Cleveland.....	4	iron.
" alley e. of, crossing Arndt.....	6	"
McGraw ave., Sixteenth to Sullivan and 76 ft. e. from Winslow	4	"
" Grand River to Twenty-sixth.....	4	"
" e. line w. Boulevard to 76 ft. e. of LaSalle	6	"
" 76 ft. e. of LaSalle to Scotten.....	4	"
McKinstry ave., River st. to n. line of Toledo.....	6	"
" alley w. of, Plumer to alley s. of	4	"
McMillan st., w. from Junction 319 ft. and crossing Livernois, e. side...	4	"
Mack ave., Riopelle to St. Aubin	6	"
" e. from St. Aubin 300 ft. and crossing Dubois and Chene.	4	"
" 100 ft. w. of Dubois to Grandy	3	"
" Grandy to Jos. Campau.....	6	"
" e. from McDougall 402 ft.	4	"
" Gratiot to Cadillac.....	42	"
" Gratiot to Townsend.....	4	"
" crossing Mt. Elliott and Townsend to Baldwin	6	"
" w. from Helen 80 ft.....	6	"
" s. side, crossing E. Boulevard 76 ft.....	6	"
" Beals to 267 ft. e. of Parker.....	8	"
" 650 ft. w. of, to 577 ft. w. of Fischer.....	8	"
" 207 ft. w. of, Fischer to 65 ft. e. of Crane s.....	8	"
" McClellan to Pennsylvania.....	8	"
" Pennsylvania to e. line of Hamilton.....	6	"
" e. line of Hamilton to e. line of Park.....	8	"
" e. line of Park to e. line of Montclair.....	6	"
Macomb st., St. Antoine to Elmwood.....	4	"
" alley s. of, from Brush to alley w. of.....	3	"
" alley s. of, from Brush to St. Antoine.....	4	"
" alley n. of, from Brush to alley w. of	3	"
" alley n. of, from Brush to St. Antoine.....	4	"
Madison ave., n. and s. sides from Witherell to John R.....	4	"
" Randolph to St. Antoine.....	4	"
" alleys n. and s. of, from John R. to Randolph.....	4	"
Magnolia st., Harrison to Thirteenth, and Fourteenth to Fifteenth	4	"
" Thirteenth to Wabash, and Eighteenth to Sullivan	3	"
" Sullivan to Maybury, and crossing Humboldt and Twenty-fourth.....	4	"
" Twenty seventh to Vinewood.....	4	"
Mansur st., Harper to 78 ft. s. of Piquette.....	4	"
Maple st., Gratiot to Orleans and crossing Dubois	8	"
" Orleans to St. Aubin.....	4	"
" St. Aubin to Elmwood	3	"
Marcy st., w. from Fourth 158 ft.	3	"
" 158 ft. w. of Fourth to Greenwood	4	"
Marietta st., e. from McClellan 521 ft.....	4	"
Mark st., w. from Twelfth 180 ft.	4	"
Marston ave., 16 inch main to e. line of Woodward.....	6	"
Martin pl., Woodward to John R.....	4	"
Maybury ave., Michigan to n. line of Ash	6	"
" n. line of Ash to 34 ft. n. of G. T. Ry	8	"
" 207 ft. s. of to 173 ft. n. of Warren	8	"
" s. from Hudson 256 ft.	8	"
Mechanic st., Brush to Beaubien	4	"
Medbury ave., Woodward to 330 ft. e. of John R. and crossing Rivard e. side.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Medbury park (for Park Comm.), between John R and Rivard (1154 ft.)..	8	Iron.
" ave., w. from St. Aubin 730 ft.....	8	"
" w. line of St. Aubin to Jos. Campau	4	"
" crossing E. Boulevard and Collins.....	6	"
" w. from Collins 165 ft.....	4	"
" 533 ft. w. of to 168 ft. e. of Mt. Elliott.....	6	"
" Helen to Frontenac.....	4	"
" Baldwin to VanDyke.....	6	"
" alley s. of e. from John R. 350 ft. and crossing Brush.....	4	"
" alley n. of e. from John R 357 ft. and crossing Brush.....	4	"
Melbourne ave., crossing Woodward, e. side.....	6	"
Meldrum ave., Jefferson to Congress.....	42	"
" Wight to Jefferson.....	10	"
" Jefferson to 46 ft. n. of Fort.....	6	"
" 46 ft. of Fort to 360 ft. n. of Kercheval.....	4	"
" 360 ft. n. of to 642 ft. n. of Kercheval.....	6	"
" Arndt to Gratiot and crossing N. Boulevard.....	6	"
Merrick ave., Cass to Third and w. from Fourth 136 ft.....	4	"
" 136 ft. w. Fourth to e. line of Greenwood.....	3	"
" e. line of Greenwood to Lincoln and Trumbull to Twelfth..	4	"
" Twelfth to Wabash.....	6	"
" w. from Seventeenth 132 ft.....	4	"
" Tillman to Twenty-third.....	4	"
" Twenty-seventh to Vinewood.....	4	"
Miami ave., Gratiot to Witherell.....	16	"
" n. side John R to Witherell	4	"
" alley w. of Gratiot to alley s. of.....	6	"
" alley w. of Gratiot to Witherell.....	4	"
" alley e. of Randolph to John R.....	4	"
Michigan Stove Works G'nds, Franklin to Woodbridge.....	4	"
Michigan ave., Woodward to Cass.....	24	"
" Washington to First.....	10	"
" First to Tenth.....	8	"
" Foundry to Twenty-fourth.....	8	"
" Tenth to Vinewood.....	24	"
" Twenty-fourth to Livernols.....	6	"
" (s. side) crossing W. Boulevard.....	6	"
" alley s. of, Shelby to Cass.....	4	"
" private alley s. of, e. from Shelby 110 ft.....	3	"
" alley n. of, from alley e. of Griswold to alley e. of Wash- ington.....	4	"
" alley n. of, from alley w. of Washington to alley w. of Cass	4	"
" alley n. of, from First to alley e. of Second.....	4	"
" alley n. of, from Second to alley e. of Third.....	4	"
Military ave., River st. to 250 ft. n. of Wabash R. R.....	6	"
" 62 ft. n. of Anthon to 157 ft. n. of McMillan.....	6	"
Miller st., Sixth to Seventh.....	3	"
" crossing Seventh.....	4	"
Milwaukee ave., Beaubien to Lincoln.....	6	"
" w. line of Avery to Twelfth and crossing Fourteenth...	6	"
" e. line of Eighteenth to 36 ft. w. of Sullivan.....	4	"
" Beaubien to w. line of Riopelle.....	4	"
" w. line of Riopelle to Dubois.....	6	"
" Dubois to Chene.....	4	"
" crossing Collins.....	9	"
Nizer ave., e. from Crane 336 ft.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Minnie ave., River st. to 582 ft. s. of Fort.....	6	Iron
" s. from Fort 582 ft.....	4	"
Mitchell ave., n. from Gratiot 265 ft.....	6	"
" 265 ft. n. of Gratiot to Canfield.....	4	"
" Canfield to Harper.....	6	"
" n. from Harper 324 ft.....	4	"
" 324 ft. n. of Harper to Trombly.....	6	"
" Trombly to Griffin.....	4	"
" crossing N. Boulevard s. side.....	8	"
Mohawk st., crossing Vinewood e. side.....	4	"
Monroe ave., n. from Cadillac square 51 ft.....	6	"
" 51 ft. n. of Cadillac square to Farmer.....	4	"
" Randolph to St. Antoine.....	8	"
" St. Antoine to Elmwood.....	4	"
" 216 ft. w. of, to 171 ft. e. of Lieb.....	4	"
" w. from Helen 183 ft.....	4	"
" alley s. of, from alley n. of Cadillac square to Randolph.....	4	"
" alley n. of, from alley e. of Woodward to Farmer.....	4	"
" alley n. of, from Farmer to alley e. of Farrar.....	6	"
Montcalm st., w. from Woodward 412 ft.....	4	"
" 412 ft. w. of Woodward to Cass.....	3	"
" alley e. of Woodward to Brush.....	4	"
" Brush to St. Antoine.....	3	"
" St. Antoine to Hastings.....	6	"
" Hastings to Russell.....	3	"
" alley s. of, w. from Beaubien 240 ft.....	4	"
Montclair ave., n. from Mack 832 ft.....	6	"
Montlieth st., crossing Vinewood e. side and w. from Twenty-seventh 198 ft.....	4	"
Moore pl., crossing W. Boulevard.....	6	"
Moran st., Gratiot to Dane.....	6	"
Morrell st., River st. to 87 ft. n. of n. line of Christianity.....	6	"
" 348 ft. s. of Dix to Toledo.....	6	"
Mott ave., 16-inch main to e. line of Woodward.....	6	"
" e. from Woodward 538 ft.....	4	"
Mt. Elliott ave., 148 ft. s. of Wight to 283 ft. s. of Kercheval.....	6	"
" 283 ft. s. of Kercheval to Preston.....	8	"
" Preston to Mack.....	10	"
" Mack to Gratiot and crossing N. Boulevard.....	4	"
" Gratiot to 300 ft. n. of Griffin.....	4	"
" 300 ft. n. of Griffin to 14 ft. n. of Strong.....	6	"
Mt. Elliott Cemetery, in cemetery grounds 1534 ft.....	4	"
Mullett st., Gratiot to Chene.....	30	"
" St. Antoine to Elmwood.....	4	"
Mulberry st., Twelfth to Thirteenth.....	4	"
Myrtle st., Grand River to Hubbard.....	6	"
Nail ave., crossing Vinewood.....	6	"
Napoleon st., Brush to Russell.....	4	"
National ave., Michigan to Grand River.....	6	"
Newark st., Nineteenth to Twentieth.....	6	"
" e. from Foundry in Griffin's foundry yard.....	2	"
Newberry st., w. from Junction 341 ft.....	4	"
Newton ave., w. from Chene 1,364 ft.....	4	"
Nineteenth st., Fort to Baker.....	4	"
" Baker to Newark.....	6	"
Noble st., w. from Fourth 150 ft.....	3	"
" 150 ft. w. of Fourth to Greenwood.....	4	"
" Sixth to Seventh.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Norton st., e. from Junction 886 ft.	4	iron.
" 386 ft. e. of Junction to Thirty-first.	6	"
" e. from Wesson 283 ft.	4	"
Oakland ave., Piquette to Trombly.	6	"
" Milwaukee to s. line of N. Boulevard.	4	"
" s. line to 24-in. main in N. Boulevard 87 ft.	6	"
" 24-in. main to n. line of N. Boulevard.	10	"
" Horton to Hamlin.	6	"
" Hamlin to Clay.	10	"
" Marston to Koch and crossing Harmon.	10	"
" Englewood to 130 ft. n. of Woodland.	8	"
Orchard st., First to Elton park, e. side.	4	"
" w. side Elton park to Sixth.	4	"
" Sixth to Trumbull.	6	"
Orleans st., Atwater to Jefferson.	10	"
" Jefferson to reservoir grounds.	8	"
" Congress to reservoir grounds.	24	"
" reservoir to Scott and s. from Canfield 80 ft.	30	"
" crossing Leland s. side and Alexandrine to Canfield.	6	"
" n. from Garfield 252 ft.	4	"
" 252 ft. n. of Garfield to 195 ft. n. of Forest.	6	"
" Trombly to Lyman.	4	"
Ottawa st., e. from Thirteenth 130 ft.	3	"
Otis st., e. from Junction 300 ft.	4	"
" 300 ft. e. of Junction to alley w. of Thirty-first.	6	"
Owen ave., 16-in. main to 1,220 ft. e. of Woodward.	6	"
Pallister ave., crossing Woodward w. side.	6	"
" w. from Hamilton Boulevard 260 ft.	6	"
Palmer ave., Woodward to w. line of Brush farm.	4	"
" crossing the same at w. line of Brush farm.	4	"
" crossing Brush and Collins.	6	"
" n. and s. sides, crossing Beaubien and St. Antoine.	4	"
" e. line of St. Aubin to 129 ft. w. of Dubois.	6	"
" 129 ft. w. of Dubois to e. line of Grandy.	4	"
" crossing Russell and St. Aubin.	4	"
" e. from Moran 190 ft.	4	"
" Mt. Elliott to 159 ft. e. of Meldrum.	6	"
" e. from Baldwin 235 ft.	6	"
" 235 ft. e. of Baldwin to Van Dyke.	4	"
Park ave., Dix to Toledo.	6	"
" (east of city limits), Mack to 568 ft. n. of Canfield.	6	"
Park pl. East, Michigan to s. line of State.	4	"
" crossing State.	6	"
Park st., e. line of Woodward to Columbia.	16	"
" Henry to Peterboro.	4	"
Parker ave., Tontit to 250 ft. n. of Coe.	6	"
" 842 ft. s. of to 534 ft. n. of Mack.	6	"
Parkman ave., 16-inch main to w. line of Woodward.	6	"
" Hamilton Boulevard to 473 ft. w. of Seventh.	4	"
Parsons st., Woodward to Cass.	4	"
Pennsylvania ave., n. from Jefferson 1,419 ft.	6	"
" Mack to 50 ft. n. of Elsa.	6	"
Perry st., Grand River to alley e. of Trumbull.	4	"
" alley w. of Trumbull to National.	4	"
" alley s. of, from alley e. of Seventh to alley e. of Trumbull.	4	"
" Eighteenth to Humboldt.	4	"

LOCATION.	DIAM. INCHES.	FROM
Peterboro st., Woodward to Cass.....	4	from.
Philadelphia ave., e. from Russell 389 ft.....	4	"
Pierce st., Dequindre to Jos. Campau.....	4	"
Pine st., Grand River to National.....	4	"
" National to Twelfth.....	3	"
" crossing Twelfth, e. side.....	4	"
Pitcher st., Cass to alley e. of Third.....	4	"
" w. from Fourth 150 ft.....	3	"
" 150 ft. w. of Fourth to Greenwood and Sixth to Seventh....	4	"
Pingree ave., Woodward to Hamilton Boulevard.....	6	"
Piquette ave., Woodward to Beaubien.....	4	"
" Beaubien to Russell.....	6	"
" 466 ft. w. of, to e. line of Chene.....	4	"
" Chene to Grandy.....	6	"
" E. Boulevard to Collins.....	4	"
" crossing E. Boulevard and Collins.....	6	"
" w. from Moran 182 ft.....	6	"
" e. from Moran 85 ft.....	4	"
" w. from Mt. Elliott 326 ft.....	4	"
" crossing Greenwood, e. side.....	4	"
" Trumbull to Lincoln.....	6	"
" w. line of Avery to Twelfth.....	4	"
" crossing Twelfth and Fourteenth, e. sides.....	6	"
" Wabash to Fourteenth.....	4	"
" Eighteenth to Sullivan.....	4	"
Pleasant ave., n. from River st. 515 ft.....	4	"
Plum st., Second to alley e. of Trumbull.....	4	"
" Trumbull to alley e. of.....	6	"
Plumer st., w. line of McKinstry to 283 ft. w. of Junction.....	4	"
" 283 ft. w. of Junction to Wesson.....	6	"
" Welch to Livernois.....	4	"
" alley s. of, alley w. of McKinstry w. 614 ft.....	4	"
Pollard st., w. from Jos. Campau 1,242 ft.....	4	"
Poplar st., 110 ft. e. of Wabash to w. line of Fifteenth.....	4	"
" crossing Thirteenth, w. side.....	4	"
" alley w of Humboldt to 51 ft w. of Sullivan.....	6	"
" e from Maybury 376 ft.....	4	"
" Tillman to 184 ft. w. of Twenty third.....	4	"
Porter st., e. from Twelfth 900 ft.....	4	"
" w from Twelfth 210 ft.....	3	"
" 210 ft. w. of Twelfth to Thirteenth.....	4	"
" e from Fourteenth 172 ft.....	3	"
" crossing Fourteenth and Eighteenth to Nineteenth.....	4	"
" Twentieth to Twenty-first.....	3	"
" w. from Twenty-first 150 ft.....	4	"
" 150 ft. w. of Twenty-first to Twenty second.....	3	"
" Twenty second to e. line of W. Boulevard.....	4	"
" e. line of W. Boulevard to Vinewood.....	6	"
" Hubbard to Scotten.....	3	"
" crossing Hubbard w. side.....	4	"
" McKinstry to Ferdinand.....	4	"
" crossing Campbell.....	6	"
" alley s. of, Thirteenth to alley e. of.....	3	"
Prentiss ave., Cass to Third.....	4	"
" alley w. of Fourth to Greenwood.....	4	"
Preston st., McQuigall to Mt. Elliott.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Private st. (n. of Ferry), crossing Rivard e. side.....	4	iron.
" (w. from) Rivard 362 ft.....	3	"
Private way (e. of Russell), s. from Clay 405 ft.....	4	"
Pulford ave., Gratiot to Mt. Elliott, and Meldrum to Beaufait.....	4	"
Putnam ave., w. from Woodward 60 ft.....	6	"
" 60 ft. w. of Woodward to w. line of Cass.....	4	"
" n. side, e. from Third 323 ft., and Fourth to Lincoln.....	4	"
" Trumbull to Twelfth.....	4	"
" w. from Twelfth 185 ft.....	3	"
" 185 ft. w. of Twelfth to w. line of Thirteenth.....	4	"
" Wabash to Fourteenth.....	4	"
Railway ave., LaSalle to 173 ft. e. of Scotten.....	6	"
Randall st., crossing Twenty-third west side, 26 ft.....	4	"
Randolph st., alley s. of Atwater to Jefferson.....	4	"
" Atwater to 24-inch main in Cadillac square.....	8	"
" Larned to Congress.....	4	"
" Congress to Adams.....	6	"
" crossing Gratiot.....	10	"
" alley w. of, n. line of Atwater to alley s. of Woodbridge.....	3	"
" alley e. of, from alley s. of Fort to Champlain.....	4	"
" alley e. of, from alley n. of Monroe to Gratiot.....	4	"
Ranspach st., Hammond to Livernois.....	4	"
Raynor st., Clinton to Gratiot.....	4	"
Reed pl., w. from Fourth 36 ft.....	4	"
" 36 feet w. of Fourth to Greenwood.....	3	"
" w. from Greenwood 335 ft.....	4	"
Reeder ave., Junction to 438 ft. w. of Campbell.....	4	"
Reservoir grounds, n. of basin to 30-inch branch.....	24	"
" s. and w. sides of basin.....	24	"
Rich st., e. from Vinewood 204 ft., and Scotten to Twenty-eighth.....	4	"
Riopelle st., Atwater to Jefferson, and Larned to Adelaide.....	8	"
" Jefferson to Larned.....	12	"
" Adelaide to 218 ft. n. of Hancock.....	6	"
" Frederick to Kirby.....	6	"
" alley e. of, Willis to Canfield.....	4	"
" alley e. of, n. from Garfield 233 ft.....	4	"
Rivard st., Atwater to Jefferson.....	8	"
" Larned to Congress.....	4	"
" Jefferson to Clinton, and Mullett to Gratiot.....	10	"
" Clinton to 9 ft. s. of Mullett.....	6	"
" Gratiot to Watson.....	4	"
" Elliot to 90 ft. s. of Warren.....	4	"
" 90 ft. s. of Warren to 10 ft. n. of Farnsworth.....	6	"
" 10 ft. n. of Farnsworth to 221 ft. n. of Palmer.....	4	"
" 221 ft. n. of Palmer to Harper.....	6	"
" crossing Piquette.....	4	"
" 5 ft. s. of, to 153 ft. n. of N. Boul.....	6	"
" 153 ft. n. of N. Boul. to Clay.....	4	"
" n. from Clay 1178 ft.....	6	"
River st., Third to Fourth and Fifth to Sixth.....	4	"
" Sixth to e. side of M. C. R. R.....	8	"
" crossing M. C. R. R. tracks 270 ft.....	6	"
" w. side of M. C. R. R. tracks to 525 ft. w. of Twenty-fourth.....	8	"
" Pleasant to Campau.....	8	"
" Campau to main entrance of Exposition Grounds.....	6	"
" s. from main into Det. & L. S. Copper Works.....	4	"

LOCATION.	DIAM. INCHES	KIND
Roby st., n. from Ferry 325 ft.....	4	iron
Rohns ave., Goethe to alley s. of Mack.....	6	"
" 300 ft. s. of Chapin to 800 ft. s. of Gratiot.....	4	"
" 800 ft. s. of Gratiot to s. line of Harper.....	6	"
Romeyn st., Junction to Campbell.....	4	"
Rose st., Eighteenth to Twentieth.....	4	"
Rosedale ave., 16-inch main to e. line of Woodward.....	6	"
" e. line of Woodward to w. line of Oakland.....	4	"
Bowena st., Woodward to Riopelle.....	4	"
Rowland st., s. from State 187 ft.....	4	"
" n. from State 237 ft.....	6	"
Russell st., Larned to n. line of Congress.....	6	"
" Congress to Macomb and Mullett to Watson.....	4	"
" Watson to Canfield.....	6	"
" Canfield to s. line of Hendrie.....	10	"
" s. line of Hendrie to s. line of Piquette.....	4	"
" s. line of Piquette to Alger.....	6	"
" alley e. of, Chase to Fort.....	4	"
" alley e. of, n. from Willis 220 ft.....	4	"
Sargent st., St. Aubin to 6 ft. e. of D., G. H. & M. Ry.....	6	"
" crossing Collins.....	6	"
Savoy st., Twenty first to Twenty-second.....	4	"
" Twenty-third to Twenty-fourth.....	4	"
Schiller st., e. from McClellan 245 ft.....	4	"
Schiller Boulevard, (n. and s. sides), at w. line of Woodward 8 ft.....	4	"
Schneider pl., e. from Ellery 105 ft.....	6	"
" 105 ft. e. of Ellery to Mt. Elliott.....	4	"
Scott st., Orleans to Chene.....	30	"
" Riopelle to e. line of St. Aubin.....	4	"
" e. line of St. Aubin to Dubois.....	4	"
" crossing Dubois to 156 ft. e.....	4	"
" 156 ft. e. of Dubois to 499 ft. e. of Chene.....	4	"
" 499 ft. e. of Chene to Jos. Campau.....	4	"
Scotten ave., Fort to Dix.....	6	"
" Dix to Buchanan.....	4	"
" Buchanan s. to Buchanan n.....	16	"
" Buchanan to McGraw.....	6	"
" alley e. of Howard to Porter.....	4	"
Seovel pl., crossing W. Boulevard to 24 ft. e.....	6	"
" in Mound " Eckstrom " 50 ft.....	4	"
Sears ave., Holcomb to 193 ft. e. of McClellan.....	4	"
Second st., Front to Woodbridge.....	6	"
" Woodbridge to alley n. of Jefferson and crossing Congress.....	10	"
" Abbott to alley s. of.....	4	"
" Abbott to Bagz.....	10	"
Second ave., High to 166 ft. n. of Henry.....	4	"
" Bagz to 30 ft. n. of Prentiss.....	4	"
" e. side, s. line of Forest to 184 ft. n. of.....	6	"
" e. side, crossing Hancock, Warren and Putnam.....	6	"
" e. side, crossing Merrick, Kirby and Holden.....	6	"
" w. side, crossing Hancock, Warren and Putnam.....	4	"
" w. side, crossing Merrick, Kirby and Holden.....	4	"
" w. side, s. from Holden 700 ft.....	2	wood
" Holden to s. line of N. Boulevard.....	6	iron
" crossing Canfield and N. Boulevard.....	4	"
" st., alley e. of, alley n. of Michigan to Spencer.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Second ave., alley e. of, alley n. of Canfield to Prentiss.....	4	iron.
Selden ave., Woodward to Third and Fourth to alley w. of.....	4	"
" alley w. of Fourth to Greenwood.....	3	"
" crossing Greenwood and Sixth to Seventh.....	4	"
Seventh st., River st. to alley n. of Lafayette.....	8	"
" alley n. of Lafayette to Bagg.....	10	"
" Bagg to Grand River and crossing Calumet.....	8	"
" Grand River to n. line of Merrick.....	6	"
" 214 ft. s. of Kirby to 684 ft. n. of Stanley.....	6	"
" alley w. of, alley n. of Pine to Spruce.....	3	"
" alley w. of, Perry to alley s. of.....	4	"
Seventeenth st., Fort to 28 ft. s. of Poplar.....	6	"
" 28 ft. s. of Poplar to s. line of Buchanan.....	4	"
" s. line of Buchanan to Warren.....	6	"
Seward ave., w. from Woodward 1070 ft.....	6	"
" 477 ft. e. of, to 184 ft. w. of Hamilton Boulevard.....	6	"
Seyburn ave., Jefferson to n. line of Agnes.....	6	"
" s. from Gratiot 462 ft.....	6	"
Shady lane, crossing W. Boulevard.....	4	"
" crossing Vinewood.....	6	"
Shakespeare Boulevard, n. and s. sides at w. line of Woodward ave. 9 ft.	4	"
Sbelby st., Atwater to Woodbridge.....	3	"
" Woodbridge to Jefferson.....	4	"
" Woodbridge to Jefferson.....	8	"
" Jefferson to Michigan.....	10	"
" Lafayette to alley s. of Michigan.....	4	"
Sheridan ave., Jefferson to 244 ft. n. of Kercheval.....	6	"
" Mack to Gratiot.....	6	"
" Gratiot to 18 ft. n. of Ferry.....	8	"
Sherman st., Hastings to Elmwood.....	4	"
" Russell to Orleans.....	8	"
Shipperd ave., n. from Champlain 250 ft.....	6	"
" n. from Florene 169 ft.....	6	"
Sibley st., Woodward to Clifford.....	4	"
Sidney ave., 16-inch main in Woodward to w. line of Oakland.....	6	"
" e. from Russell 779 ft.....	4	"
Sixth st., River st. to Congress.....	16	"
" Congress to Abbott.....	24	"
" River st. to alley n. of.....	4	"
" alley n. of Labrosse to Cherry.....	4	"
" Cherry to 47 ft. s. of Bagg.....	12	"
" s. from 24-inch main in Bagg 94 ft.....	16	"
" n. from Bagg 88 ft and crossing Calumet.....	8	"
" n. from Grand River 473 ft.....	4	"
" 473 ft. n. of Grand River to Calumet.....	6	"
" Calumet to 285 ft. n. of Lysander.....	4	"
Sixteenth st., Lafayette to Myrtle.....	6	"
" Myrtle to Buchanan.....	8	"
" Buchanan to Grand River.....	10	"
" Grand River to McGraw.....	6	"
" s. from 24-inch main in N. Boulevard 63 ft.....	8	"
" alley w. of, Lafayette to Howard.....	3	"
Smith ave., Woodward to Oakland.....	4	"
South st., Grand River to Noble.....	4	"
Southern ave., e. from Livernois 152 ft.....	4	"
Spencer st., Cass to Second.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Sproat st., Woodward to Cass	4	IRON.
Spruce st., Fifth to alley w. of Seventh	4	"
" alley w. of Trumbull to National	4	"
" Harrison to Twelfth	4	"
" Twelfth to Thirteenth	6	"
" alley s. of, alley w. of Seventh to alley e. of Trumbull	3	"
St. Albertus pl., 22 ft. e. of Dequindre to 260 ft. w. of St. Aubin	4	"
" w. from St. Aubin 260 ft.	3	"
St. Antoine st., Atwater to Congress and crossing Champlain	8	"
" Jefferson to Congress	4	"
" Congress to n. line of Gratiot	6	"
" Gratiot to Elizabeth	4	"
" Elizabeth to Adelaide	6	"
" Adelaide to Watson and crossing N. Boulevard	8	"
" Watson to Farnworth and crossing Frederick	6	"
" crossing Palmer	6	"
" s. line of Medbury to s. line of N. Boulevard	6	"
St. Aubin ave., Atwater to s. line of Harper	6	"
" s. line of Harper to Trombly	8	"
" Trombly to n. line of N. Boulevard	10	"
" Clay to 22 ft. n. of Danforth	6	"
" Larned to Congress	12	"
" Congress to Champlain	36	"
" alley e. of, Kirby to Palmer	4	"
" alley w. of, s. from Ferry 266 ft.	4	"
St. Clair pl., alley w. of Eighteenth to Nineteenth	4	"
St. Joseph st., Russell to Riopelle	3	"
" e. line of Riopelle to 310 ft. e. of St. Aubin	4	"
" crossing Chene	4	"
" 310 ft. e. of St. Aubin to 202 ft. e. of Chene	4	"
" 202 ft. e. of Chene to Grandy	4	"
" Grandy to Jos. Campau	6	"
" w. line of McDougall to 48 ft. e. of	3 & 4	"
St. Paul ave., Bellevue to e. line of Concord	4	"
" crossing E. Boulevard	6	"
" e. line of E. Boulevard to e. line of Field	4	"
" Townsend to Baldwin and Crane to alley w. of	4	"
Standish st., Twentieth to Foundry	6	"
Stanley ave., w. from Greenwood 365 ft. and crossing Fourteenth	6	"
" Seventh to Commonwealth	4	"
" w. from Twelfth 183 ft. and crossing Eighteenth and Humboldt	4	"
Stanton ave., Merrick to 97 ft. n. of Stanley and crossing N. Boulevard	6	"
Stark ave., Welch to Livernola	4	"
State st., Woodward to Washington	20	"
" Woodward to Cass	10	"
" w. of branch in Washington 24 ft.	24	"
Stimson pl., Woodward to Cass	4	"
Sullivan ave., Michigan to Buchanan and crossing Warren	6	"
" 33 ft. n. of Stanley to Baltimore	6	"
" crossing N. Boulevard	8	"
Summit ave., River st. to Wabash R. R. and s. from Fort 300 ft.	6	"
Superior st., w. from Beaubien 280 ft. and crossing Brush	4	"
" Beaubien to Russell	6	"
" Riopelle to Dequindre	4	"
" Dequindre to St. Aubin	6	"

LOCATION.	DIAM. INCHES.	KIND.
Superior st., crossing e. side St. Aubin and Chene	4	iron.
" St. Aubin to 343 ft. e. of Chene	3	"
" 343 ft. e. of Chene to Mitchell, and McDougall to Gratiot... 4	4	"
Swain ave., 40 ft. s. of Wabash R. R. to Fort	6	"
Sycamore st., w. from Grand River 123 ft.	6	"
" alley west of Trumbull to National, and Harrison to Wabash	4	"
Sylvan st., w. from Twenty-seventh 103 ft., and e. from Vinewood 65 ft. 4	4	"
" 105 ft. w. of Twenty-seventh to 65 ft. e. of Vinewood	6	"
Sylvester st., Gratiot to Mt. Elliott, and Beaufait to Concord	4	"
Taylor ave., crossing Hamilton Boul.	6	"
Tenth st., River st. to Abbott.	8	"
" Abbott to Michigan	24	"
Theodore st., John R. to 106 ft. e. of Riopelle	4	"
" 268 ft. w. of St. Aubin to Grandy	4	"
" crossing Collins and e. from Helen 191 ft.	6	"
" e. from Moran 375 ft.	4	"
" Mt. Elliott to w. line of Beaufait	4	"
" alley s. of, e. and w. of Davis pl. 150 ft.	4	"
Third st., Front to s. line of River st., and Larned to alley n. of.	6	"
" s. line of River st. to Larned	8	"
" Larned to Fort	24	"
" Abbott to High	6	"
" alley e. of, Front to alley n. of	4	"
" alley e. of, alley n. of Michigan to Lewis	4	"
Third ave., Grand River to Bagg and crossing Calumet	8	"
" Bagg to Holden and crossing Baltimore	6	"
" Calumet to Canfield	30	"
" alley e. of, Henry to Brainard	4	"
Thirteenth st., River st. to Fort	4	"
" Fort to Howard	6	"
" Porter to Ash and crossing Myrtle	6	"
" Magnolia to n. line of Grand River	6	"
" n. line of Grand River to 15 ft. n. of Canfield	4	"
" 15 ft. n. of Canfield to Hancock	6	"
" n. from Hancock 150 ft.	4	"
" 150 ft. n. of Hancock to Merrick	6	"
" alley e. of, s. from Porter 131 ft.	4	"
Thirtieth st., 30 feet s. of Jackson to Buchanan	6	"
" Devereaux to 153 ft. s. of Warren	6	"
Thirty-first st., Michigan to 250 ft. s. of Warren, and s. from Norton 105 ft.	6	"
Thirty-second st., Michigan to 82 ft. n. of Horatio	6	"
Thirty-third st., Michigan to Horatio	6	"
Thirty-fourth st., 60 ft. s. of, to 136 ft. n. of Jackson	8	"
" 64 ft. s. of, to 132 ft. n. of Buchanan	8	"
" 132 ft. n. of Buchanan to 126 ft. n. of Rich	6	"
Thirty-fifth st., Michigan to 193 ft. n. of Jackson and crossing Buchanan s. of Buchanan 202 ft.	6	"
" n. line of Buchanan to 223 ft. n. of Rich	8	"
Thompson ct., n. of Forest 115 ft.	4	"
Tillman ave., Michigan to Breckenridge	6	"
" 198 ft. s. of, to 4 ft. n. of Warren	6	"
" 360 ft. s. of, to 300 ft. n. of Merrick (on the w.)	6	"
" Hudson to McGraw	6	"
Toledo ave., crossing W. Boulevard and Hubbard to 360 ft. e. of Scotten, 6	6	"

LOCATION.	DIAM. INCHES	KIND.
Toldeo ave., 300 ft. e. of Scotten to McKinstry.....	4	iron
" McKinstry to Livernois.....	6	"
Torrey st., crossing Scotten (w. side), and Lovett to Twenty-eighth.....	4	"
Townsend ave., Jefferson to 234 ft. n. of Kercheval.....	6	"
" n. from Mack 308 ft.....	6	"
" 308 ft. n. of Mack to s. line of Gratiot.....	4	"
" s. line to 8-inch main in Gratiot.....	5	"
" 8-inch main in Gratiot to 65 ft. n. of Palmer.....	6	"
Trombly st., Oakland to Hastings.....	6	"
" Crystal to Russell.....	4	"
" Russell to s. line of St. Aubin.....	4	"
" w. from Chene 183 ft.....	6	"
" Chene to 72 ft. e. of Ellery.....	4	"
" 72 ft. e. of Ellery to Mt. Elliott and crossing Collins.....	6	"
Trowbridge ave., 16-inch main to s. line of Woodward.....	6	"
" e. from Woodward 511 ft.....	4	"
Trumbull ave., Abbott to alley s. of.....	10	"
" n. from Abbott 30 ft., and Michigan to Plum.....	6	"
" Grand River to alley n. of.....	6	"
" Calumet to Forest.....	4	"
" Forest to 497 ft. n. of G. T. Ry.....	6	"
" 497 ft. n. of G. T. Ry. to 50 ft. n. of Piquette.....	4	"
" 50 ft. n. of Piquette to Holden.....	6	"
" alley e. of, Plum to Sycamore.....	6	"
" alley w. of, Cherry to Pine.....	3	"
" alley w. of, Pine to Myrtle.....	4	"
" alley w. of, alley n. of Grand River to Calumet.....	6	"
Tuscola st., Third to Fourth.....	6	"
" alleys n. and s. of, alley w. of Fourth to Greenwood.....	4	"
Twelfth st., 458 ft. s. of River st. to Lafayette.....	4	"
" Howard to Baker.....	4	"
" Baker to Calumet.....	6	"
" Calumet to s. line of N Boulevard.....	4	"
" s. line of, to 16 ft. s. of n. line of N Boulevard.....	10	"
" 200 ft. e. of, Porter to alley n. of.....	4	"
Twentieth st., Fort to Michigan.....	6	"
" alley e. of, s. from Rose 197 ft.....	3	"
Twenty-first st., Fort to Standish.....	4	"
Twenty-second st., Fort to Dalzelle.....	6	"
" alley e. of, Brevoort to Webster.....	4	"
Twenty-third st., Fort to Magnolia.....	6	"
" Magnolia to 35 ft. n. of Linden.....	3	"
" 35 ft. n. of Linden to 100 ft. n. of Poplar.....	4	"
" 100 ft. n. of Poplar to Kirby and crossing McGraw.....	6	"
" Kirby to s. line of McGraw.....	4	"
Twenty-fourth st., River st., to Fort.....	4	"
" Fort to Baker.....	6	"
" Baker to s. line of Michigan.....	4	"
" s. line of, to 96 ft. n. of Michigan.....	16	"
" 96 ft. n. of, to 141 ft. n. of Michigan.....	18	"
" 141 ft. n. of, to 236 ft. n. of Michigan.....	20	"
" 236 ft. n. of Michigan to Butternut.....	24	"
" Butternut to Buchanan.....	10	"
" Buchanan to n. line of McGraw.....	4	"
" n. line of McGraw to Chope pl.....	6	"
Twenty-fifth st., Howard to Baker.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Twenty-fifth st., Baker to 65 ft. s. of Toledo.....	6	iron.
" E st. to Michigan.....	4	"
" Michigan to Linden.....	6	"
" n. from Linden 192 ft.....	3	"
" 595 ft. s. of Buchanan to Hancock.....	6	"
" crossing Warren and 69 ft. s. of Hudson to n. line of McGraw.....	6	"
Twenty-sixth st., 213 ft. s. of E st. to 146 ft. s. of Hancock.....	6	"
" 146 ft. s. of to 421 ft. n. of Hancock.....	8	"
" 421 ft. n. of Hancock to McGraw.....	6	"
Twenty-seventh st., Myrtle to McGraw.....	6	"
" crossing Buchanan.....	8	"
Twenty-eighth st., Michigan to 14 ft. n. of Rich.....	6	"
Twenty-ninth st., 565 ft. s. of Michigan to Buchanan.....	6	"
Union st., Fourth to Fifth.....	3	"
" crossing Fifth (e. side).....	4	"
Uthas st., Clark to McKinstry.....	4	"
Van Dyke ave., Jefferson to 150 ft. n. of Waterloo and Mack to n. line of Gratiot.....	8	"
" Jefferson connecting with 42-inch main 22 ft.....	10	"
" s. from Mack 1329 ft. and Gratiot to Harper.....	6	"
Vine st., Fourth to Fifth.....	3	"
" crossing Fifth (e. side).....	4	"
Vinewood ave., Fort to Buchanan.....	24	"
" Fort to 430 ft. n. of Toledo and F st. to Buchanan.....	6	"
" Buchanan to Merrick.....	10	"
" s. from Grand River 300 ft.....	8	"
Virginia ave., 16-inch main to 5 ft. e. of w. line of Woodward.....	6	"
" (n. and s. sides), w. line of Woodward to Hamilton Boul.....	4	"
Vinager st., Vinewood to La Salle and crossing Scotten e. side.....	6	"
" Lovett to Twenty-eighth.....	6	"
Wabash ave., crossing Grand River and N. Boulevard.....	6	"
" n. line of M. C. R. R. to Ottawa.....	6	"
" Ottawa to s. line of Buchanan.....	4	"
" s. line of Buchanan to s. line of L. S. R. R.....	8	"
" s. line of L. S. R. R. to 186 ft. n. of Piquette.....	6	"
" alley e. of, Bagg to Myrtle.....	6	"
Walbridge st., w. from Van Dyke 221 ft.....	6	"
Walker st., Atwater to Jefferson.....	4	"
Walnut st., w. from Van Dyke 264 ft.....	6	"
Warren ave., Woodward to Cass and Second to Third.....	4	"
" Third to Greenwood.....	6	"
" Greenwood to 106 ft. w. of Seventh.....	4	"
" e. from Trumbull 107 ft.....	6	"
" Avery to alley w. of Wabash.....	4	"
" Fourteenth to Sixteenth.....	4	"
" Grand River to w. line of Scotten.....	6	"
" Woodward to 105 ft. e. of Riopelle.....	4	"
" Moran to Detloff ct. and crossing Collins.....	6	"
" Warren ct. to Grandy and e. from Helen 228 ft.....	4	"
Warren ct., 181 ft. s. of to 56 ft. n. of Warren ave.....	4	"
Warsaw pl., 17 ft. e. of Dequindre to St. Aubin.....	6	"
Washington ave., Michigan to State.....	30	"
" Michigan to Park.....	10	"
" alleys e. and w. of, alley n. of Michigan to alley s. of Park.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Waterloo st., Dequindre to Jos. Campau.....	4	iron
" Jos. Campau to Burlage pl.....	6	"
" Burlage to Mt. Elliott.....	4	"
" Mt. Elliott to 57 ft. e. of Beaufait.....	4	"
Watson st., Woodward to Brush.....	4	"
" Brush to Reservoir.....	24	"
" Dequindre to Chene.....	4	"
Wayne st., s. from Woodbridge 173 ft.....	4	"
" Woodbridge to Michigan.....	6	"
Webster pl., alley w. of Eighteenth to Nineteenth.....	4	"
" Twenty-second to alley e. of.....	6	"
Webb ave., 16 inch main to w. line of Woodward.....	6	"
" w. line of Woodward to Hamilton Boul. e. line.....	4	"
Welch ave., Plumer to s. line of M. C. R. R.....	6	"
" 211 ft. s. of, to 309 ft. n. of Stark.....	6	"
" s. line of Ingervoll to n. city limits.....	6	"
Wesson ave., Toledo to 84 ft. n. of Dunn.....	6	"
" n. line of G. T. Ry. to Leavitt.....	6	"
" D. L. & N. Ry. to 190 ft. n. of Herbert.....	6	"
Western Hay Market, w. from Trumbull 171 ft.....	3	"
Westminster ave., 16-inch to 1,222 ft. e. of Woodward.....	6	"
Whipple st., Baldwin to Van Dyke.....	4	"
Whiting ave., e. from Jos. Campau 1,840 ft.....	4	"
Widman pl., Harper to 55 ft. n. of Piquette.....	6	"
Wight st., Chene to McDougall.....	4	"
" McDougall to Mt. Elliott.....	10	"
" Mt. Elliott to 110 ft. e. of Mel drum.....	6	"
" alley s. of, e. from McDougall 230 ft.....	4	"
Wilcox st., Woodward to Miami.....	12	"
Wilkins st., Brush to Russell.....	4	"
" 158 ft. w. of Ripelle to Orleans.....	4	"
" Orleans to 30 inch main in Chene.....	4	"
Willard st., e. from Van Dyke 255 ft.....	4	"
Williams ave., Michigan to 196 ft. n. of Breckenridge.....	6	"
" crossing Warren, and n. line of Merrick to Hudson.....	6	"
Willis ave., Woodward to Beaubien, and e. from Hastings 356 ft.....	4	"
" Beaubien to St. Antoine, and 356 ft. e. of Hastings to Rivard.....	3	"
" St. Antoine to Hastings.....	6	"
" Rivard to Russell.....	6	"
" Russell to e. line of Chene.....	4	"
" e. line of Chene to Grandy.....	3	"
" Jos. Campau to Collins.....	4	"
" e. from Collins 146 ft., and Moran to alley w. of Mt. Elliott.....	4	"
" Woodward to Fourth.....	6	"
" Fourth to Greenwood, and Sixth to Eighth.....	4	"
" e. from Twelfth 215 ft.....	6	"
" crossing Twelfth, e. side.....	4	"
Winder st., Woodward to Orleans.....	4	"
Wing pl., alley w. of Eighteenth to Nineteenth.....	4	"
Winslow ave., n. from Grand River 85 ft.....	4	"
" 85 ft. n. of Grand River to McGraw.....	6	"
Winter st., e. from Dequindre 431 ft.....	4	"
Witherell st., e. line of Woodward to Miami.....	16	"
" Woodward to Miami.....	6	"
" Miami to Adams.....	4	"
" Adams to alley n. of.....	2	"

LOCATION.	DIAM. INCHES.	KIND.
Wolff st., e. from Scotten 857 ft.....	4	Iron.
Woodbridge st., Randolph to Brush and St. Antoine to Rivard.....	4	"
" w. from St. Antoine 230 ft. and Rivard to Russell.....	3	"
" Russell to Orleans and e. from Jos. Campau 400 ft.....	4	"
" Orleans to Dubois and w. from Jos. Campau 300 ft.....	6	"
" 400 ft. e. of Joseph Campau to McDougall.....	6	"
" w. from Leib 325 ft.....	4	"
" crossing Woodward.....	8	"
" Woodward to Griswold and First to Second.....	6	"
" Griswold to First.....	4	"
" alley s. of, Bates to Randolph.....	4	"
" alley s. of, Brush to 210 ft. e. of Beaubien.....	3	"
Woodland ave., 16-inch main to e. line of Woodward.....	6	"
" e. from Woodward 780 ft.....	4	"
Woodward ave., Atwater to Jefferson and N. Boulevard to Woodland... 16		"
" (e. side), s. from Atwater 246 ft.....	3	"
" (e. side), s. from N. Boulevard 102 ft.....	4	"
" (w. side), s. from Atwater 171 ft.....	4	"
" Jefferson to Soldiers' Monument and Baggs to Edmund.. 24		"
" Atwater to Adams and Baltimore to Clay.....	8	"
" Adams to Baltimore.....	10	"
" High to 200 ft. n. of Canfield.....	4	"
" Woodland to 15 ft. n. of city limits.....	12	"
" (w. side), crossing Virginia.....	6	"
" (w. side), crossing Shakespeare Boulevard.....	6	"
" (w. side), crossing Schiller Boulevard.....	6	"
" (e. side), crossing Melbourne on the s. side.....	6	"
" (e. side), crossing Chicago Boulevard.....	6	"
" (e. side), crossing Boston Boulevard.....	6	"
" alley e. of, alley s. of Atwater to alley s. of Jefferson.. 4		"
" alley e. of, alley n. of Jefferson to alley n. of Congress.. 4		"
" alley e. of, Gratiot to alley s. of.....	6	"
" alley e. of, n. from Gratiot 130 ft.....	8	"
" alley e. of, 130 ft. n. of Gratiot to alley s. of Witherell.. 4		"
" alley e. of, Elizabeth to alley s. of.....	3	"
" alley e. of, crossing Elizabeth, s. side.....	4	"
" alley e. of, Elizabeth to Columbia.....	6	"
" alley e. of, Columbia to Montcalm.....	4	"
" alley w. of, Atwater to alley s. of Jefferson.....	4	"
" alley w. of, Larned to Congress.....	4	"
" alley w. of, Larned to Congress.....	8	"
" alley w. of, Congress to alley n. of.....	4	"
" alley w. of, alley n. of Michigan to alley s. of Park..... 4		"
" alley w. of, Montcalm to High.....	3	"
Woodward ave. terrace, Woodward to w. line of John R.....	4	"
Wrexford pl., Eighteenth to Grand River.....	4	"
" crossing w. Boulevard.....	6	"
Zender pl., e. from Ellery 288 ft.....	6	"
" 288 ft. e. of Ellery to Mt. Elliott.....	4	"

SUPPLEMENT.

BOARD OF MANAGEMENT OF DETROIT WATER WORKS.

Board of Trustees appointed by Common Council, February 24th, 1852; organized March 1st, 1852:

Shubael Conant, Chairman.	Edmund A. Brush.
Henry Ledyard.	Jas. A. Van Dyke.
Wm. R. Noyes.	

1853.

On the 16th of May, 1853, the Board of Water Commissioners of the City of Detroit was organized under an act previously approved by the Common Council and passed by the Legislature, February 14th, 1853. The term of service was determined by lot, as follows:

Jas. A. Van Dyke,	for 3 years.
Edmund A. Brush,	for 4 years.
Henry Ledyard,	for 5 years.
Shubael Conant,	for 6 years.
Wm. R. Noyes,	for 7 years.

Shubael Conant was elected President, who, finding the duties too arduous, resigned July 30th, and Edmund A. Brush was elected.

1854.

Edmund A. Brush, President.	Jas. A. Van Dyke.
Shubael Conant.	Wm. R. Noyes.
Henry Ledyard.	

1855.

Edmund A. Brush, President.	Wm. R. Noyes.
Henry Ledyard.	Jas. A. Van Dyke, died May
Shubael Conant.	8th.
A. D. Fraser, appointed to fill vacancy.	

1856.

Edmund A. Brush, President.	Alexander D. Fraser, re-ap-
Shubael Conant.	pointed May 1st for 5 years.
Wm. R. Noyes.	Henry Ledyard.

1857.

Edmund A. Brush, President,	Henry Ledyard.
re-appointed May 1st for 5	Alexander D. Fraser.
years.	Wm. R. Noyes.
Shubael Conant.	

1858.

Edmund A. Brush, President.	Henry Ledyard, re-appointed
Shubael Conant.	May 1st for 5 years.
Alexander D. Fraser.	Wm. R. Noyes.

1859.

Edmund A. Brush, President.	Julius D. Morton, appointed
Alexander D. Fraser.	for 5 years.
Wm. R. Noyes.	Henry Ledyard, vacated by
Shubael Conant, term expired	removal from city, and
May 1st, and	Jno. V. Ruehle, appointed May
	1st to fill vacancy.

1860.

Edmund A. Brush, President.	Wm. R. Noyes, re-appointed
Alexander D. Fraser.	May 1st for 5 years.
Julius D. Morton.	Jno. V. Ruehle.

1861.

Edmund A. Brush, President. Jno. V. Ruehle, resigned Sept.
Alexander D. Fraser, re-ap- 16th, and
pointed May 1st for 5 years. Chauncey Hurlbut, appointed
to fill vacancy.

1862.

Edmund A. Brush, President, Wm. R. Noyes.
re-appointed May 1st for 5 Julius D. Morton.
years. Chauncey Hurlbut.
Alexander D. Fraser.

1863.

Edmund A. Brush, President. Chauncey Hurlbut, term ex-
Alexander D. Fraser. pired May 1st, and
Wm. R. Noyes. Stanley G. Wight appointed
Julius D. Morton. for 5 years.

1864.

Edmund A. Brush, President. Julius D. Morton, term expired
Alexander D. Fraser. May 1st.
Wm. R. Noyes. Stanley G. Wight.

1865.

Edmund A. Brush, President. Alexander D. Fraser.
Wm. R. Noyes, resigned Jan. Stanley G. Wight.
10, and Jacob S. Farrand Julius D. Morton, re-appointed
appointed to fill vacancy. for 5 years from May 1st,
Term expired May 1st. Re- 1864. Died Feb. 14, 1865,
appointed for 5 years. and
Jno. Owen appointed to fill
vacancy.

1866.

Edmund A. Brush, President.	Stanley G. Wight.
Alexander D. Fraser, re-ap- pointed May 1 for 5 years.	Jacob S. Farrand. Jno. Owen.

1867.

Edmund A. Brush, President, re-appointed May 1 for 5 yrs.	Jacob S. Farrand. Jno. Owen.
Alexander D. Fraser.	Stanley G. Wight.

1868.

*Edmund A. Brush, President.	Jacob S. Farrand.
Stanley G. Wight, term expired May 1, and	John Owen. Caleb Van Husan.
Chauncey Hurlbut appointed for 5 years.	

*Edmund A. Brush resigned January 28, and Caleb Van Husan appointed to fill vacancy, and Alexander D. Fraser elected President.

1869.

Alexander D. Fraser, President.	Jacob S. Farrand.
Jno. Owen, re-appointed May 1, for 5 years.	Caleb Van Husan. Chauncey Hurlbut.

1870.

Alexander D. Fraser, President.	Jno. Owen.
Jacob S. Farrand, re-appointed May 1, for 5 years.	Caleb Van Husan. Chauncey Hurlbut.

1871.

*Alexander D. Fraser, President.	Caleb Van Husan.
Jacob S. Farrand.	Chauncey Hurlbut.
John Owen.	

*Term expired May 1, and Samuel F. Hodge appointed for 5 years. Jacob S. Farrand elected President.

1872.

Jacob S. Farrand, President. *Caleb Van Husan.
 Jno. Owen. Samuel F. Hodge.
 Chauncey Hurlbut.

*Term expired May 1st, and Elija Smith appointed for 5 years.

1873.

*Chauncey Hurlbut, President. Jacob S. Farrand.
 Jno. Owen. Samuel F. Hodge.
 Elija Smith.

*Term expired and re-appointed. Elected President May, 1872.

1874.

Chauncey Hurlbut, President. Jacob S. Farrand.
 *Jno. Owen. Samuel F. Hodge.
 Elija Smith.

*Term expired and re-appointed.

1875.

Chauncey Hurlbut, President. *Jacob S. Farrand.
 Jno. Owen. Samuel F. Hodge.
 Elija Smith.

*Term expired and re-appointed.

1876.

Chauncey Hurlbut, President. Jacob S. Farrand.
 Jno. Owen. *Samuel F. Hodge.
 Elija Smith.

*Term expired and re-appointed.

1877.

Chauncey Hurlbut, President. Jacob S. Farrand.
 Jno. Owen. Samuel F. Hodge.
 *Michael Martz.

*Elija Smith's term expired and Michael Martz appointed to fill vacancy.

1878.

*Chauncey Hurlbut, President. Jacob S. Farrand.
Jno. Owen, Samuel F. Hodge.
Michael Martz.

*Term expired and re-appointed.

1879.

Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. *Jas. Beatty.
*Jno. Pridgeon.

*Jno. Owen's term expired and Jno. Pridgeon appointed to fill vacancy. Samuel F. Hodge resigned and Jas. Beatty appointed to fill vacancy.

1880.

Chauncey Hurlbut, President. *Jacob S. Farrand.
Michael Martz. Jas. Beatty.
Jno. Pridgeon.

*Term expired and re-appointed.

1881.

Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. *Jas. Beatty.
Jno. Pridgeon.

*Term expired and re-appointed

1882.

Chauncey Hurlbut, President. Jacob S. Farrand.
*Michael Martz. Jas. Beatty.
Jno. Pridgeon.

*Term expired and re-appointed.

1883.

*Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. Jas. Beatty.
Jno. Pridgeon.

*Term expired and re appointed.

1884.

Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. Jas. Beatty.

*Jno. Pridgeon.

* Term expired; Marshall H. Godfrey appointed.

1885.

*Jacob S. Farrand, President. Michael Martz.
Marshall H. Godfrey. *Edwin F. Conely.

*Samuel G. Caskey.

* Jas. Beatty died and Edwin F. Conely appointed to fill vacancy.

* Chauncey Hurlbut died and Samuel G. Caskey appointed to fill vacancy.

* Jacob S. Farrand's term expired and re-appointed.

1886.

Jacob S. Farrand, President. Michael Martz.
Marshall H. Godfrey. *Jno. Pridgeon.

Samuel G. Caskey.

* Edwin F. Conely's term expired and Jno. Pridgeon appointed to fill vacancy.

1887.

Jacob S. Farrand, President. Jno. Pridgeon.
Marshall H. Godfrey. Samuel G. Caskey.

*Joseph Nagel.

* Michael Martz's term expired and Joseph Nagel appointed to fill vacancy.

1888.

Jacob S. Farrand, President. Jno. Pridgeon.
Marshall H. Godfrey. *Samuel G. Caskey.

Joseph Nagel.

* Term expired and re-appointed.

1889.

Jacob S. Farrand, President. Jno. Pridgeon.
Samuel G. Caskey. Jos. Nagel.

*August Goebel.

* Marshall H. Godfrey resigned Jan. 1, 1889. August Goebel appointed to fill vacancy. Term expired May 1st, and re-appointed.

1890.

Jno. Pridgeon, President. Samuel G. Caskey.
Joseph Nagel. August Goebel.
*Henry M. Duffield.

* Jacob S. Farrand's term expired, and Col. Duffield was appointed to fill vacancy July 9th, 1890, Jno. Pridgeon resigned as President of the Board, on account of ill health, and Henry M. Duffield was elected to fill vacancy.

1891.

Henry M. Duffield, President. *Jno. Pridgeon.
August Goebel. Samuel G. Caskey.
Joseph L. Hudson.

* Jno. Pridgeon's term expired May 1st, and Frank E. Kirby was appointed for a term of 5 years.

1892.

Samuel G. Caskey, President. Henry M. Duffield.
August Goebel. Joseph L. Hudson.
Frank E. Kirby.

1893.

August Goebel, President. Samuel G. Caskey.
Frank E. Kirby. Henry M. Duffield.
Joseph L. Hudson.

REGULATIONS

OF THE

Board of Water Commissioners

OF THE

CITY OF DETROIT.

JANUARY, 1894

DETROIT.

THE RICHMOND & BACKUS CO., PRINTERS.

1894.



AN ORDINANCE

OF THE

Board of Water Commissioners.

ADOPTED JANUARY 15, 1894.

*It is hereby ordained by the Board of Water Commissioners of
the City of Detroit :*

CHAPTER I.—THE BOARD.

MEETINGS.

Section 1. The regular meetings of the Board shall be upon the second Wednesday of each month, with the exception of January, in which month there will be no regular meeting.

In lieu thereof, and for the purpose of closing the annual operations of the Board, there will be a meeting on the 30th of December of each year, or, when the 30th occurs on Sunday or Saturday, the said meeting shall be held on the 29th thereof.

Special meetings of the Board may be held at any time, on the call of the President, or upon the written

request of two or more members, filed with the Secretary. A majority of the Board shall constitute a quorum.

ORDER OF BUSINESS.

1. Reading of the proceedings of the previous meeting.
2. Petitions and communications.
3. Reports of officers.
4. Reports of committees.
5. Unfinished business.
6. Resolutions, etc.

STANDING COMMITTEES.

Sec. 2. There shall be the following standing committees:

Ways and Means.

Extension and Construction.

Pumping Works.

Supplies.

These Committees shall consist of two members each, appointments to which shall be by the President annually, or when vacancies occur, the President to be *ex-officio* member of each Committee. The duties of the Committee of Ways and Means shall especially pertain to the finances, and the auditing of bills; the Committee on Extension and Construction to the laying of water mains, the caring therefor, and all construction and repairs that do not properly come under the supervision of the Committee on Pumping Works.

The Committee on Pumping Works, to the supervision of everything pertaining to the pumping of water and the construction and maintenance thereof, as well as the charge of the grounds and their improvement and adornment under the Hurlbut will.

The Committee on Supplies to have supervision of all purchases for the works, except such as are provided for by special act or resolution of the Board, and to direct heads of departments where and in what quantities such purchases are to be made.

CHAPTER II.

OFFICERS.

Section 1. At the first regular meeting in May, in each and every year, the Board shall choose one of their own number as President and one as Vice-President, who shall hold office until the regular meeting in May in the year next ensuing.

Sec. 2. There shall be appointed by the Board, should the Board deem it necessary, one General Superintendent, one Civil Engineer, one Secretary, one Superintendent of Extension, one Superintendent of Meters and Inspection, one Engineer and Assistant Engineer, one Storage Keeper, one Superintendent of Grounds under the Hurlbut will, one Receiving Clerk, seven or more Assessors and Collectors of Water Rates, one or more Inspectors, and such other officers as the Board may deem necessary.

Sec. 3. Every officer so appointed shall, if required, before entering upon the duties of his office, enter into bonds to the Board of Water Commissioners of the city of Detroit, with sureties, to be approved by the Board, conditioned that he will faithfully perform the duties of his office, and will, on demand, deliver over or pay to his successor in office or to the proper officer or agent of the Board, all books, papers, moneys, effects and property belonging to the Board, or appertaining to his office, which may be in his custody or due from him as such officer; and such bond may be further conditioned as the Board shall prescribe.

Sec. 4. All officers and employes of the Board shall give their whole time to the service of the Board. They shall hold their respective offices and employments during the pleasure of the Board, unless otherwise provided. All officers and employes, unless otherwise agreed upon,

shall receive such compensation as the Board may from time to time deem expedient. It shall be their duty strictly to observe and obey all the rules and regulations of the Board of Water Commissioners, and report to the Board, committee or proper officer any violations of its ordinances or regulations.

PRESIDENT.

Sec. 6. It shall be the duty of the President to preside at all meetings of the Board; to certify all claims allowed by the Board; to sign all checks for money; and to exercise a general supervision over the finances of the Board, and the management of the works. In the absence of the President, or in case of his inability, the Vice-President shall discharge his duties, and in case of the absence of both President and Vice-President the Chairman of the Committee on Ways and Means shall act as President.

SECRETARY.

Sec. 7. The Secretary shall attend all meetings of the Board and keep a record of all proceedings. He shall receive all accounts and demands against the Board, examine them, present them for their action, and after their allowance file and preserve them; countersign all checks for money; and shall make in the month of January in each year a report to the Board of all matters falling within the range of his duties during the preceding year.

GENERAL SUPERINTENDENT.

Sec. 8. The General Superintendent shall have general supervision of the Works and its various departments. All other officers shall be under his direction and control, and it shall be his duty to see that the said officers and employes perform their duties in accordance with the Regulations of the Board. He shall attend all meetings of the Board, and shall make such recommendations pertaining to the operations or construction of

the Works as may seem necessary to him. He shall make, in the month of January of each year, a report to the Board of the general operation and construction of the Works as may be of interest or importance.

It shall be his duty to keep a complete set of books, wherein shall be entered a full and accurate statement of all the receipts and expenditures of the Board. He shall especially have general control and supervision of the assessment and collection of the water rates, subject to the supervision of the Committee on Ways and Means, and he shall, when the annual assessments are completed, make a written report of the same to the Board. He shall keep in his office a daily journal, in which shall be entered all complaints relative to the supply of water, and orders given to the repairers of leaks in pipes, etc., and all work performed by the same. He shall issue all permits for service connections with distribution pipes. He shall issue plumbers' licenses, under such rules and regulations as may be provided by the Board, and shall make complaint of all plumbers who shall violate the ordinances of the Board governing such work. He shall make monthly statements to the Board of moneys received, the condition of the bank account on the first day of the current month, and such other matters as may be deemed necessary. The book accounts and vouchers in his office shall be examined semi-annually under the direction of the Committee on Ways and Means. He shall give notice of the meetings of the Board, and perform such further services as may be required of him by the Board.

CIVIL ENGINEER.

Sec. 9. The Civil Engineer shall have advisory superintendence over the Works and its different departments to this extent, that he advise with, and make such recommendations to, the Board, or its General Superintendent, concerning anything in said departments that he may deem advisable, and give such advice to the heads of said departments as the said officials may require.

He shall have charge, particularly of the system of the supply and distribution mains, and shall make it his especial study and care that the said system be made as complete and perfect as possible, and that proper records be kept of the same.

He shall, in connection with the Superintendent of Extension, advise the Board as to the size of pipe to be laid in any street or alley, upon petitions being received therefor.

He shall make such drawings, plans and specifications as may be required of him by the Board, preparatory to any changes, repairs or construction; and he shall have immediate superintendence of such construction and of such changes and repairs in any department as may be deemed advisable by the Board.

He shall on the first day of each month make a report in writing to the Board in regard to such matters as may have come under his superintendence in extension or construction, and make such recommendations as he may think necessary.

He shall in January of each year make a report to the Board upon all such matters as may have fallen under his supervision during the preceding year, together with such suggestions and recommendations for the future as in his judgment would be for the welfare of the Works.

SUPERINTENDENT OF EXTENSION.

Sec. 9. The Superintendent of Extension shall have a general care of all the water pipes, hydrants, gates and stop-cocks belonging to the Works. It shall be his duty to attend to the sufficiency of supply of pipes, stop-cocks, reservoir gates, and all materials whatever, required to meet every casualty or demand, in his department, and to report to the General Superintendent from time to time, what articles are required to be procured. He shall keep an accurate inventory of all tools, implements and materials in his department, and make out a list of all such tools and materials remaining on hand on the first day of January in each year, and report the

same to the Board. He shall give his personal attention to laying such lines of pipe as may be directed by the Board, and all repairs to be made in his department. He shall carefully examine and inspect all of the distribution pipes of the works, with a view to such repairs as may be required to prevent waste of water, and report concerning the same to the General Superintendent, and shall direct the shutting off of the supply of water from such premises as the said Superintendent may direct.

He shall examine all petitions for extension of pipe, report thereon the size, the cost, and the bonus (if any) necessary under the requirements of the Board, and submit the same to the Civil Engineer for approval.

He shall make monthly reports in writing to the Board of all work done in his department during the preceding month. He shall, between the first and tenth days of January, make an annual report to the Board of all matters falling within the range of his duties during the preceding year.

SUPERINTENDENT OF METERS AND INSPECTION.

Sec. 10. The Superintendent of Meters and Inspection shall have supervision of all service pipes and connections whatsoever supplying water to the premises of citizens; and whenever any leaks are discovered in service connections he shall require the same to be forthwith repaired, by the owner thereof, and if the same are not so repaired, to shut off the supply of water therefrom.

He shall have charge of all work done by plumbers and the proper inspection of the same, and shall notify the General Superintendent whenever there is any infringement of the rules and regulations of the Board in this particular.

He shall have charge of the placing of meters and the care thereof, and upon the first day of each month, or as soon thereafter as possible, he shall see that a correct reading of all the meters and indicators be furnished the meter clerk.

He shall have charge of the inspection of premises and the regular examination of all service connections and fixtures.

He shall have charge of the making of all service connections with the supply mains, after permission has been obtained, by the plumber, of the General Superintendent.

He shall, between the first and tenth days of January of each year, make an annual report to the Board of all work done in his department, and shall make at the same time a report of all the tools and materials remaining on hand in his department from carefully prepared inventories of the same. He may also make such recommendations as he may think proper for his department.

ENGINEER.

Sec. 11. The Engineer shall have charge of the engine houses and engines, and the buildings at the pumping works, and shall have supervision of any construction or repairs of any machinery therein. He shall keep an accurate record of the duty of the engines, in such books as may be provided therefor. He shall measure and certify to the General Superintendent the quantity and value of the fuel that may be purchased and received from time to time. He shall keep an account of all labor performed, and certify all claims and demands for labor or materials, done or had, in his department. He shall forthwith report to the appropriate committee all damages to the engines or buildings, or other property under his charge. He shall purchase such supplies as are required in his department that are not provided for by resolution of the Board or by contracts entered into by the Board, under instructions from the Committee on Supplies. He shall perform such other duties in connection with his department as may be necessary, and shall conform to such instructions as he may, from time to time, receive from the Board, or the proper committee. He shall make monthly written reports to the Board. He shall make an annual report showing the quantity

and cost of fuel used, and an inventory of all material on hand, and may also advise the Board as to further operations in his department.

SUPERINTENDENT OF THE GROUNDS.

Sec. 12. The Superintendent of the Grounds around the pumping works shall have charge of the same and of all work performed thereon, under the immediate control of the Committee on Pumping Works.

He shall have charge of all men employed in beautifying and improving the grounds under the Hurlbut will and shall keep a list of all tools and materials belonging in his department. He shall, between the first and tenth days of January of each year, make a report to the Board of all work performed in his department, together with an inventory of all properties in his possession, and may offer such recommendations as to future work on the grounds as may seem best to him.

ASSESSORS AND COLLECTORS.

Sec. 13. The Board may divide the city into such number of collection districts, and appoint such number of Collectors as it shall deem expedient. It shall be the duty of the several Collectors, between the first day of May and the first day of July, in each year, to make an assessment upon all persons using water from these works, and report the same to the General Superintendent. They shall also make all subsequent assessments.

Great care must be taken that the assessments are correct, and to do this the Assessor must not go upon any previous knowledge that he may possess, except in regard to fixtures, but must faithfully examine every premise.

The assessment books must be written up and the office books copied therefrom, as the blanks require; the lot, block, frontage and farm correctly entered; and the cross streets defined by a red line, either above, below,

on both the readings of streets, or sides of streets, appearing on the right-hand side of page, must be defined by red lines above and below.

The assessments on each assessment book must be footed and aggregated by the Assessors, and the footings and aggregations must be footed and aggregated in the same manner by an Assessor other than the one that made the assessments, and such aggregates certified to by the Assessor.

The Assessors will report for duty in office the last day of the third month of each quarter, the entire amount of each quarter, and such a first part of each quarter as the General Superintendent may determine for the purpose of receiving rates and performing such other work as may be necessary.

They will also report for duty in office at such times during the second and third months of each quarter as the General Superintendent may direct.

It shall be their duty in the second and third months of each quarter, to call upon all water takers within their districts who have not paid their rates for the current quarter, and to leave on the premises a notice that unless said water rates and percentage are paid on or before the expiration of such quarter, the water will be shut off without further notice; and the Collectors shall promptly, at the end of every such quarter, report to the General Superintendent the names of all those who have failed to comply with such demand, and to whom such notices have been given. And it shall be the duty of the General Superintendent, upon receiving such report, to cause the water to be shut off in all cases where the rates and percentage remain unpaid. It shall be their duty to give receipts for water rates received by them corresponding with each assessment, and to preserve the stubs of such receipts. At the expiration of each month the Collectors severally shall make out statements of all moneys collected and paid over by them during the month. They shall, promptly, pay over to the

Receiving Clerk all moneys received by them. They are especially charged with the duty of seeing that no person or persons use water from these works without paying therefor.

, Sec. 14. Receipts, and stubs therefor, shall be filled out completely, as the blanks require.

At the time of making a receipt the Assessor shall enter the amount so received in the Collector's book, and, at such time as is convenient, these stubs shall be posted in office book and the number of the stub placed over such posting by an Assessor other than the one making the receipt, and all "losses" or "gains," on such stubs, shall be recorded in books prepared for this purpose, by the Assessor posting in office book. The Assessor so posting will certify to the correctness of such stubs opposite the last stub in each settlement.

The Assessors are required, before leaving the office, in second month, to see that all stubs are posted, all loss and gain recorded, and, upon office book opposite, such premises as are delinquent in payment more than the ensuing quarter, all memorandums that may be pertinent to the collection of such rates, such as "shut for non-payment," "shut for vact.," etc., etc.

They will verify, each in his own district, stubs made by the Receiving Clerk during second and third months.

Sec. 15. The Meter Clerk shall perform such duties as are herein described, and such other duties as he may be called upon to do, from time to time, by the Superintendent of Meters, under whose direction and control he will be. He will occupy his desk during the office hours of the Board, unless excused therefrom by the said Superintendent or the General Superintendent, and shall perform the following duties:

He shall have custody and charge of all the books and papers necessary to the collection of Meter Rates, and the keeping of a correct record of the same.

He shall have supervision of the work of reading the Meters in the City, which shall be performed on or

before the first day in each month, and shall keep a complete record of such readings upon books prepared for that purpose.

He shall immediately upon ascertaining such readings, transcribe the same upon bills prepared for that purpose, said bills to state amount of water consumed, and the sum due the Board therefor, and present them for payment to the parties from whom the payment is due.

He shall receive all moneys paid to the Board for water consumed through meters, and shall keep a correct record of such payments upon Receipt Stubs and also upon the Books of Record above referred to.

He shall promptly pay over to the Receiving Clerk all moneys received by him, and at the end of each month he shall make a written statement to the General Superintendent of the said receipts.

He shall, on the 20th day of each month, or as soon thereafter as possible, prepare a list of such consumers who are in arrears for the payment of their rates, and present the same to the Superintendent of Meters, who shall cause in such case the water to be shut off until the amount of the delinquent rates and percentage be paid.

Meter Rates, as per resolution of the Board previously adopted, are required to be paid on or before the 15th day of each month, and if not paid as required, Five per cent will be added to the amount due. If not paid on or before the 20th of each month, the water will be shut off, as before provided.

RECEIVING CLERK.

Sec. 16. The Receiving Clerk shall receive all moneys paid for water rates, for materials or for any other purpose, and keep a correct record of the same upon books provided him for that purpose.

He shall deposit all moneys so received in such bank as may be designated by the Board.

During such portions of the second and third months of each quarter, when the Collectors are serving notices, he will receive water rates, giving receipts therefor, the stubs of which, together with the stub number, will be posted in office book by the Assessors, as designated by the General Superintendent from time to time, and in the Collectors' books, each in his own district, who will also verify the stub additions and their entries in the cash book.

Sec. 17. The Receiving Clerk, in connection with the duties already imposed upon him, will verify the settlements as made by the Assessors, personally, as to the similarity of totals in settlement book and on stubs, and as to the fact that the stubs are settled for continuously; and will also see that the footings on stubs are verified; that the said stubs are properly posted and promptly settled for. He is particularly charged with the duty of seeing that the Assessors and Collectors comply with the regulations governing their duties.

His instructions in regard to the Collectors applies to the Meter Clerk and Permit Clerk as well.

STORAGE KEEPER.

Sec. 18. The Storage Keeper shall reside on the Storage Grounds and shall have charge of the said grounds. He shall have charge as custodian of all properties of the Board, iron pipes, special castings, etc., that are stored there from time to time, and shall keep a correct account of the same and furnish an inventory thereof, whenever he may be required so to do.

He shall have charge of the houses located in the Storage Grounds, and of the men employed in said grounds, and of the horses stabled there.

He shall, in his care of the grounds, promptly eject any visitor who shall commit any nuisance or trespass upon the premises.

INSPECTORS.

Sec. 19. The inspectors shall examine and let on new

connections, make and keep in proper books a record of gates and stop-boxes, and, under the direction of the Superintendent of Meters and Inspection, shall enforce the regulations of the Board in regard to the character of plumbing in private premises, reporting promptly to the said Superintendent all violations of the same. They shall enforce under the direction of the Collectors payment of rates assessed for special purposes; and perform such other duties as the Board shall direct.

PERMIT CLERK.

Sec. 20. The Permit Clerk shall have charge of the issuing of permits to plumbers, and the keeping of the records of the shutting off and the letting on of water in private connections for any purpose whatsoever.

He shall also receive all delinquent water rates due upon assessments previous to the present one, and in such collection shall be governed by the rules applied to the Assessors and Collectors.

He shall report each month's receipts, losses and gains, to the General Superintendent and to the several Assessors.

CHAPTER III.

PLUMBERS AND PLUMBING.

Section 1. No person shall make any attachment or connection with the pipes of the Water Works, nor make any repairs, additions to, or alterations of, any fixtures connected with service water pipes, unless licensed as a plumber.

Sec. 2. Licensed plumbers must be residents of Detroit, and not less than twenty-one years of age. They must be regularly educated plumbers, masters of their trade. They must have established places of business, with proper signs thereon, designating name and nature of business, or be employed by business firms having such requirements, and who are upon their bonds for the correct performance of their work. Each person licensed shall pay therefor the sum of five dollars. All licenses will expire on the first day of May subsequent to the date of their issue. The license of any plumber may at any time be suspended or revoked by the Board of Water Commissioners for violation of any of their rules and regulations. At the time of receiving a license, the party licensed shall execute and file with the Board of Water Works Commissioners a bond, approved by the General Superintendent, in the sum of five hundred dollars to indemnify and save harmless the City of Detroit from all damages and losses that may result from careless or imperfect workmanship, or by reason of failure to comply with the requirements of the Board of Water Commissioners.

Sec. 3. Plumbers, to obtain such licenses, must comply with such regulations as the Board may adopt from time to time.

Sec. 4. Plumbers must make application to the General Superintendent for permission to perform all work, whether upon new or old connections, unless it be simply

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or repairs, before commencing such work, upon blanks furnished them at the office of the Board.

Sec. 5. They will leave the water turned off in cases of new connections or on premises where it was turned off previous to their making any repairs or alterations of existing fixtures. They will afford proper opportunities for inspection by the Board of new service pipes before covering the same, and therefore, no service pipe, either outside or inside the "stop," shall be covered before such inspection. Pipe covered contrary to this regulation will be again exposed for inspection, and no further permit will be granted the plumber until this requirement is fully complied with.

No plumber shall allow his name to be used by any other party, directly or indirectly, for the purpose of doing work, or obtaining permits under his license.

Sec. 6. Before receiving a permit to connect the service or supply pipe with the iron pipes, there must be paid such sum as the Board may require to cover the expense of the service cock and inserting the same, which service cock will be inserted by persons employed by the Board for that purpose.

Sec. 7. All service pipe connecting with the distributing pipes of these works, shall be made either of cast iron, block tin, lead, or of such other material as may be approved by the Board. The lead service pipe to be used in making connections with the pipes of the works, either within the building or in the ground, shall not be lighter than "strong" for all sizes, and all joints thereon shall be "wiped." Cup joints will not be permitted. All stop or hydrant faucets connected therewith, shall be perfect and made of good material, and all such service pipes must be at least four feet below the surface of the earth. Service pipe must not be laid in sewer ditch, but must be laid at least 18 inches therefrom.

Where premises have cellar or basement service pipes will be extended into same before any branches are taken therefrom for any purpose whatever. This restriction includes connections for hose, outbuildings, etc.

A valve for shutting off the water will be required to be placed in said service pipe immediately inside cellar or basement wall.

Sec. 8. The Board reserves the right to attach a meter to any service pipe, at any time whenever it shall deem it expedient so to do, and thereafter charge for the quantity of water measured or used, instead of the yearly schedule rates before charged. After said meter is so attached, and notice thereof served upon the owner, agent or tenant of the premises, any damage which said meter may sustain resulting from the carelessness of said owner, agent or tenant, or from the neglect of either of them to properly secure and protect the same, as well as any damage which may result by hot water or steam setting back from a boiler, shall be paid to said Board on presentation of bill. And in case said payment is not so paid, it is understood and agreed that the water may be shut off from said premises without notice and will not be turned on again until all charges are paid.

And all persons are hereby forbidden to interfere with or remove a water meter from any service where it has been attached without first receiving permission from the proper officers of said Board.

On such connections as the Board may desire to place a meter, there shall be a suitable place provided therefor, free from all danger of frost and perfectly accessible, and owners or occupants are strictly prohibited from placing any obstruction over box containing meter, or to interfere with the reading thereof.

Sec. 9. All connections heretofore or hereafter made with these works shall be provided with a good and sufficient stop-cock therein, which shall be protected by an iron box leading from the same to the surface of the earth, and covered with an iron cover with the letters "water" thereon, and be so exposed as to be easily found; and the same shall be placed outside of the lot, within one foot of the line, or inside the curbstone within one foot thereof.

Sec. 10. It is expressly forbidden any plumber to lay inside of premises a service along any outside wall or in any position where there is danger of frost, or to make any new connections or attachments thereto, or any new attachments or fixtures to old connections, that shall require a running stream, to prevent freezing, or for any other purpose, unless special permit is granted therefor.

Sec. 11. All water closets hereafter connected with service pipes must be provided with appliances approved by the Board. Under no circumstances will red water closets be permitted. Every service pipe must be furnished with a stop and waste-cock below the action of the frost, so situated that the water can be completely shut off and drained from the pipes to prevent freezing.

Sec. 12. Where larger connections than one inch are made, the gate controlling such service pipe shall have a stem the head of which shall be as follows: 2 inch or under, $1\frac{1}{2}$ inch square head; 3 inch or over, 2 inch square head.

Sec. 13. In all cases where one connection is intended to supply more than one tenement, shop, store or building, it shall be the duty of the person making such connection, or causing the same to be made, to lay down a branch with stop-cock for each, outside the line of premises so to be supplied, to be covered and marked as provided for in section 9.

Special permission will be granted, however, by application to the Superintendent of Meters, for one pipe, with meter thereon, to be put in supplying the whole premises. In cases where other service pipe is required than that already in premises, the plumber must disconnect the service pipe already in at the main, unless special permission is given allowing it to remain. Plumbers will therefore inform themselves as to the condition in all old premises before taking out a permit.

Sec. 14. All work performed by plumbers shall be subject to inspection under the direction of the Superintendent of Meters and Inspection, who has authority.

hereby granted him, to order any part of such work to be discontinued or changed in order that the same shall comply with the regulations and requirements of the Board.

Sec. 15. It is expressly required that new connections shall be ready for inspection and tapping at 12 noon; and in case the work is not ready for the tappers, and a second visit is necessary, an additional charge of at least \$1.00 will be required to be paid.

Sec. 16. The failure to perform work in accordance with the above regulations shall subject the plumber, in the discretion of the Board, to a temporary or permanent forfeiture of his license.

CHAPTER IV.

WATER RATES AND ASSESSMENTS.

Section 1. The rates to be charged for water on each house or other building having or using water, and upon the lot or lots upon which such house or other buildings are situated, shall be annually assessed by the Collectors, or such other persons as may be designated by the Board, before the first day of July in each year; and the amount charged shall be for one year, commencing on the first day of July and ending on the thirtieth day of June next ensuing.

Sec. 2. If any such lot or lots shall lie partly in two or more wards, the same shall be assessed in the ward where such building is situated. The Assessor shall describe the premises thus assessed, by referring to the number and section of the lot or lots, and shall describe all such lot or lots, or subdivision thereof, by referring to the number and section of the lot, and the owner or occupant thereof; and if the number and section of any lot, or the owner thereof cannot be ascertained, then by such other sufficient description as the Assessor may deem proper; and if by mistake, or otherwise, any person may be improperly designated as the owner of any lot or premises, such assessment shall not for that cause be vitiated, but the same shall be a lien on such lot or premises, and collected as in other cases.

Sec. 3. There shall be made out and completed assessment rolls, in books to be provided by the Board for that purpose. Such rolls shall be signed by the Collectors respectively, or such other person as may make the assessment. After signature, the rolls severally shall be delivered to the General Superintendent of the Board, and shall be open for the inspection of all persons interested, at the office of the Board, and any person consid

ering himself aggrieved by reason of any assessment may complain thereof to the Board of Water Commissioners. The Board shall, on the last business day of June in each year, meet at their office for the purpose of reviewing, correcting and approving said rolls. The General Superintendent shall cause notice of such meeting to be published in the daily newspaper published by the printer for the city, and in one other daily newspaper published in said city, for at least one week prior to the time appointed for such meeting of the Board, stating that said assessment rolls are completed and open for inspection, the time and place of meeting of said Board, and the object for which it will meet.

Sec. 4. Any person considering himself aggrieved by reason of any assessment, may complain thereof, verbally or in writing, before the said Board, and on sufficient cause being shown, by the affidavit of such person, or by other evidence to the satisfaction of such Board, they shall hear and determine such matter in a summary manner, and correct any errors which they may discover in the assessment rolls, and alter and correct the same. The concurrence of a majority of the Board shall be sufficient to decide any question of alteration or correction of any assessment complained of. The Board, or majority of them, having completed the review and correction of the assessment rolls, shall, if any corrections are therein made, cause said corrections or changes to be noted and written upon said rolls, and the President shall sign the same.

Sec. 5. The rates, when assessed and confirmed by the Board, shall be final and conclusive, subject only to revision by the Board, except as herewith provided. A notice filed in the office of the Board that the consumption of water has been decreased, either by a reduction of the number of families, the disconnection by a licensed plumber of fixtures, or for any other cause whatsoever, will entitle the premises to a new assessment from the beginning of the quarter after the notice is filed; said new

assessment to be contingent upon the present and future uses of water.

Sec. 6. The Collectors shall make all assessments that shall become necessary subsequent to the annual assessment, and place the same upon the assessment rolls.

Sec. 7. The rates for all premises using water shall be due and payable quarterly in advance, at the office of the Board of Water Commissioners, to wit: On the first days of July, October, January and April. If not paid in those months, the Collectors shall proceed to deliver notices demanding payment thereof, and shall add to the assessment a sum equal to five per cent thereof; and if not paid until the expiration of the quarter, ten per cent shall be added. In default of payment until the expiration of the quarter, the water may be shut off; and the water may be withheld from any person who is in arrears for water rates until the amount due is paid, and in addition thereto the further sum of fifty cents for shutting off and letting on the water whether such premises are occupied by the same or other persons; and in cases where extra labor may be performed to shut the water off from said premises, a just compensation shall be paid therefor before the water is again let on; and the water may be withheld from any person who may be in arrears for water rates, until the amount is fully paid, whether such person resides on the premises where the water was used, for which they may be in arrears, or on any other premises. The supply of water may be withheld from premises occupied by more than one family using water from the same connection, unless the owner of such premises pays the water rates assessed thereon; and where more than one assessment is made for water used from the same connection, in case of the neglect or refusal of any one so assessed to pay the amount of water rate, the water may be shut off from such connection.

For the collection of meter rates see Sec. 15, Chap. 2.

Sec. 8. Every rate or assessment shall be and remain a lien upon the lands and premises assessed from and

after the time such rates or assessments shall become due and payable as aforesaid; and if there be a default in paying the same or any part thereof for a longer period than six months, the Board may cause a notice to be published in the daily newspaper published by the printer for the city once a week for four successive weeks and posted in three or more public places in each ward requiring the owners or occupants of, or parties in interest in such lands, hereditaments or premises, to pay such rates or assessments; and that if default be made in making such payment, such real estate will be sold at public auction at a day and place specified in said notice, for the lowest term of years at which any person shall offer to take the same in consideration of advancing and paying such assessed water rates or assessments upon the lots, with the costs and charges in the premises.

Sec. 9. If the owners or occupants of, or parties in interest in such lands, hereditaments or premises, do not pay such water rates or assessments, with the costs and charges, within the period above prescribed for the publication of said notice, then the Board shall, without any further notice, cause such lands, hereditaments, or premises, to be sold at public auction for the lowest term of years at which any person shall offer to take the same in consideration of advancing the water rates or assessments, with costs and charges, and shall execute a proper certificate of such sale to the purchaser thereof; and if such lands, hereditaments or premises shall not be redeemed within one year after such sale thereof, as hereinafter provided, the General Superintendent of the Board, in the name of and for the Board of Water Commissioners of the City of Detroit, shall execute and deliver to such purchaser or his assignee a proper deed for the conveyance of such real estate for the term for which the same was sold. And in all sales as aforesaid, if the purchaser or his assignee shall die before the deed or another conveyance shall be executed, the deed may be executed to, and in the name of, the deceased person, if such deceased person, being still alive, would be

entitled to a deed or conveyance; which deed or conveyance shall vest the title in the heirs or devisees of such deceased person, in the same manner, and liable to like claims of creditors and other persons, as if the same had been executed to such deceased person immediately previous to his death; or the executor or administrator may assign the certificate of purchase, and a deed or conveyance may issue to the assignee thereof.

Sec. 10. When any lands, hereditaments or premises shall be sold as aforesaid for the payment of water rates, or of assessments aforesaid, if the owners or occupants of, or the parties in interest in the same, shall, within one year after such sale, deposit with the General Superintendent of the Board, for the use of the purchaser, the full amount of such water rate or assessment for which the sale was made, together with interest thereon, from the time of sale, on the amount of the rate or assessment, together with the amount of costs and charges, then the term for which such real estate was sold shall cease and be determined at the time of the making of such deposit.

Sec. 11. It shall be the duty of the General Superintendent of the Board to bid in for said Board at any sale of lands, hereditaments or premises for water rates or assessments, every lot and all premises for which no other person shall bid. And if any purchaser shall refuse or neglect to pay the sum or sums bid by him, upon demand by the said Superintendent, said bid shall inure to the use and benefit of the Board, if they so elect. Upon all such bids by the said Superintendent, and all bids for the use and benefit of the Board, conveyances and certificates of the sale shall be executed by the Superintendent to the said Board, and be acknowledged by him; and, when duly acknowledged, they may be recorded as other conveyances of land under the laws of this State.

Sec. 12. The General Superintendent of the Board shall, within thirty days after such sale as aforesaid, make a correct record showing the time when the water rates and other assessments were levied, and the amount

thereof in each case, the amount of costs and charges, the time when the sales were made, the names of the purchasers, and the term for which the same was bid. And said record shall be deposited in the office of the Board, and shall be subject to inspection during office hours.

Sec. 13. It shall be the duty of the General Superintendent to contract on the best terms in his power for the publication of the notices for the sales aforesaid. In such contract there shall be a provision for the price or cost of the advertising of each description. The cost or price of such advertising shall be added to the amount of the assessment applicable to the premises specified in such description.

Sec. 14. It shall be the duty of the General Superintendent to obtain, file and preserve affidavits of the due publication of all such notices as are required to be given by this ordinance.

Sec. 15. Before water is used for building purposes, the owner of the premises shall obtain a permit therefor by paying an assessment based upon the architect's estimates of quantities. Water used in violation of this rule will be shut off, and assessments for such as shall have been used shall remain against the building until paid.

Sec. 16. The scale of water rates shall be such as is now or may be hereafter established by the Board.

Sec. 17. Where a continued flow of water is desired, the pipe where the water is delivered shall be of such size as will deliver the quantity desired, and the assessment shall be for the measured capacity of the pipe.

Sec. 18. Proper reduction in water rates may be made by the General Superintendent, and all disputed rates must be settled at his office.

CHAPTER V.—SUPPLY OF WATER.

PIPES.

Section 1. All petitions filed with the General Superintendent for the extension of water pipes shall be delivered to the Superintendent of Extension, whose duty it shall be to inspect the proposed line, measure the distance, make an estimate of the cost of constructing the same, ascertain the probable income which would be derived therefrom, and report to the Board without unnecessary delay.

CONNECTIONS.

Sec. 2. It shall be the duty of every person whose premises are supplied with water, to prevent other persons from procuring water from such premises, except by the written permit of the General Superintendent of the Board, and if he knowingly permits such use his assessment may be increased.

Sec. 3. The supply of water may be withheld from premises when the ordinances, rules and regulations of the Board have in any manner been violated. If any person shall, after the water has been shut off from any premises, cause or suffer such premises to be supplied with water, without permission, such premises shall be disconnected from the distribution pipes of the water works.

Sec. 4. The officers and employes of this Board may, at all reasonable hours, enter upon any lot or premises, to inspect the condition of the water works, and make such alterations and repairs or do such other acts as shall be deemed by them necessary; and any person whose premises are supplied with water, shall be deemed as assenting to the rules and regulations of the Board.

Sec. 5. The premises of any person adjacent to any street or alley through which the water pipes are laid, may be supplied with water by application to the General Superintendent. All of the connections thereto shall be made only by a plumber, duly authorized and licensed by the Board. All such connections must be made in conformity with the ordinances and regulations of the Board. In case the person or persons whose premises are to be supplied with water shall procure the work of said connections and attachments to be done by any other person than the licensed plumber, who may be named in said permit, the Board may, at its pleasure, withhold the supply of water from the premises aforesaid.

Sec. 6. In regard to the provision requiring iron stop-boxes, as specified in Sec. (9), "Plumbers and Plumbing," in cases of connection heretofore made, the occupant of the premises, or, if the same be unoccupied, the owner thereof, if resident of the city, and if the owner be non-resident, then the agent, shall be notified of the provisions of this section, and shall at the same time be notified that if the same are not complied with within fourteen days from the time of such notification, the supply of water will be shut off. Water rates on said premises shall not thereafter be received until the provisions of this section are complied with. If the provisions of this section shall not be complied with within the time limited by such notification, the supply of water shall be shut off unless the period for which the water rates upon said premises shall have been paid shall not have expired, in which event the water supply shall be shut off as soon as such last mentioned period shall have terminated.

Sec. 7. If the connection or branch pipe, stop or hydrant cock, through which the premises of any person are supplied with water, shall be out of repair in any manner, it shall be the duty of such person forthwith to have the same repaired.

HYDRANTS.

Sec. 8. When hydrants are exposed to general use, it shall be the duty of the owner of the premises benefited to construct or alter such hydrant in such manner as to draw the water by a key to be removed from the hydrant when not required for the purpose of procuring water, and the supply of water shall be shut off from all hydrants thus exposed in violation of this provision.

FOUNTAINS.

Sec. 9. Private fountains or jets shall not be used more than three hours each day, unless specially permitted, with payment of additional assessment; and the right is reserved to suspend the supply of water to all fountains, either public or private, whenever, in the discretion of the Board, the public exigency may require it.

METERS.

Sec. 10. Meters shall be placed wherever it may be deemed best by the Board, and especially where large quantities of water are required or flowing streams, or in cases where, from the nature of the business, it is reasonable to suppose there is considerable waste.

Sec. 11. The expense of purchasing and placing meters upon service pipes connected with the Works, shall be borne entirely by the Board, and all meters so placed shall remain the property of the Board and be under its sole supervision and control.

WASTE.

Sec. 12. Any person who shall waste the water on his premises or permit such waste, shall be liable to have his assessment increased in proportion to such waste, such increase to be collected the same as other assessments, or, in the discretion of the Board, the water may be shut off entirely, or a meter be placed thereon.

CHAPTER VI.

Section 1. This ordinance shall take effect and be in force from and after the fifteenth day of January, 1894. The water rates shall continue as now established until otherwise directed by the Board. All other ordinances, and all rules and regulations contravening this ordinance are hereby repealed. The adoption and passage of this ordinance shall not be construed to operate to discharge any person guilty of any violation of such repealed ordinances, rules or regulations, or to invalidate any vested rights of the Board of Water Commissioners, or of individuals, or the acts or proceedings of any officer or agent of said Board had or done in accordance with such ordinances, rules or regulations now repealed; but all such rights are hereby retained.

PENALTIES.

[Extract from an Act of the Legislature "To amend the Laws relative to 'Supplying the City of Detroit with Pure and Wholesome Water,' and to provide for the completion and management of the Detroit Water Works," approved April 12, 1873.]

"Sec. 21. If any person shall willfully do, or cause to be done, any act whereby any work, materials, or property whatsoever, erected or used within or without the City of Detroit by the Commissioners, or by any person acting under their authority, for the purpose of procuring or keeping a supply of water, shall be injured, or shall willfully throw or place, or cause to be thrown or placed, any carcass of any dead animal or person, or any other deleterious or filthy substance whatever, in any reservoir, pipe, or aqueduct of said Board, through which water for public or private use is conveyed, or shall throw or place, or cause to be thrown or placed, any such carcass, deleterious or filthy substance into the Detroit river or Lake St. Clair, within a distance of six miles above any inlet pipe of said Board extending into said river, and through which said supply of water or any thereof is received, or do, or cause to be done, any other act to willfully pollute said water, he shall be guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not exceeding five hundred dollars, or imprisonment in the House of Correction for a period

not exceeding two years, or both, at the discretion of the court before which the case is tried. The Commissioners shall erect notices of so much of this section as relates to reservoirs and the Detroit river and Lake St. Clair at conspicuous points on such reservoirs and along the American shore of said river and lake within the distance above mentioned, and for this purpose they or their agents shall have the right to enter upon private property.

"Sec. 22. If any person shall, without authority of the Commissioners or their proper agents, perforate or bore, or cause to be perforated or bored, any distributing pipe, main, log, or aqueduct, belonging to said works of this Board, or make, or cause to be made, any connection or communication with said pipes, aqueducts, or logs, or meddle with or move the same, or any machinery, apparatus, or fixture of the Board, or take down or deface any of the notices provided for in the last section, or cause the same to be done, the person so offending shall, on conviction, be punished by a fine not exceeding one hundred dollars, and shall also be sentenced to imprisonment in the Detroit House of Correction until such fine be paid, not exceeding six months. Any person who shall willfully and maliciously break or cut any inlet pipe, main distributing pipe, log, or aqueduct, used by the Commissioners for conducting said water, or shall dig into, or break up, any reservoir filled, or partially filled, with water, or shall break or injure any pumping engine, or any part thereof, or any of the machinery connected therewith, belonging to said Board, or cause any of said acts to be done, shall be deemed guilty of felony, and upon conviction thereof shall be punished by imprisonment in the State Prison not more than five years, or by a fine not exceeding one thousand dollars, and imprisonment in the jail of said Wayne County not more than one year. All violations of the provisions of this act shall, when committed within the limits of the City of Detroit, be tried in the Recorder's Court of said city, and when committed beyond said limits, they shall be tried in the Circuit Court for the County of Wayne."

Wm C & T Chronicle

Jan- 1913

PASPERY
WILLIAM S. DANA
CHAS. H. & FRANK
JAMES E. HARRIS

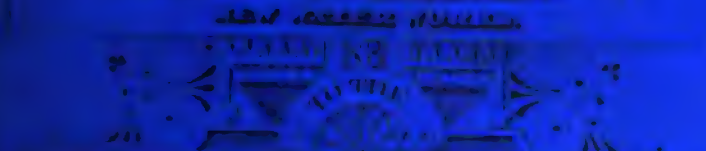
FOURTY-THIRD

NEW YORK

NEW YORK

OF THE

BOARD OF WATER COMMISSIONERS



COMMON COUNCIL CITY OF DETROIT

FOR THE YEAR

1894.



FORTY-THIRD ANNUAL REPORT

RECEIVED,

OF THE

MAR 22 1895

Board of Water Commissioners
WILLIAM B. DANA COMPANY.

TO THE

COMMON COUNCIL OF THE CITY OF DETROIT,

TOGETHER WITH THE

REPORTS OF THE OFFICERS OF THE BOARD

FOR THE YEAR 1894.

DETROIT:

THE DETROIT FREE PRESS PRINTING COMPANY.

1895.

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BOARD OF WATER COMMISSIONERS.

DETROIT, 1894-95.

MEMBERS:

HENRY M. DUFFIELD, 1895. FRANK E. KIRBY, 1896.
ALBERT L. STEPHENS, 1897. DEWITT H. MORELAND, 1898.
EDWARD W. PENDLETON, 1899.

COMMITTEES:

WAYS AND MEANS.....Commissioners STEPHENS, PENDLETON.
EXTENSION AND CONSTRUCTION..Commissioners MORELAND, KIRBY.
PUMPING WORKS.....Commissioners KIRBY, STEPHENS.
SUPPLIES.....Commissioners PENDLETON, MORELAND

OFFICERS:

PRESIDENT	HENRY M. DUFFIELD.
VICE-PRESIDENT.....	FRANK E KIRBY.
GENERAL SUPERINTENDENT	} L. N. CASE.
SECRETARY	
CIVIL ENGINEER.....	G. S. WILLIAMS.
SUPT. OF EXTENSION.....	HENRY BRIDGE.
SUPT. OF METERS AND INSPECTION	THOMAS R. PUTNAM.
SUPT. OF GROUNDS.....	E. A. SCRIBNER.
CHIEF ENGINEER.....	URIAH GOULD.
FIRST ASSISTANT ENGINEER.....	THOMAS SPACKMAN.
CONSULTING ENGINEER.....	JOHN E. EDWARDS.
METER CLERK.....	HARRY S. STARKEY.
	FRED. H. HUTAFF.
	W. W. WILCOX.
	JOHN J. ROBINSON.
	PETER J. BECKER.
ASSESSORS AND COLLECTORS	THOS. W. GOODALE.
	ANTHONY VOGEL.
	CHARLES J. PATERSON.
	GEORGE A. WINSLOW.
RECEIVING CLERK.....	GEORGE E. KUNZE.
PERMIT CLERK.....	JOHN E. LONG.
PURCHASING AGENT.....	THOMAS E. LYNCH.
AUDITOR.....	J. A. M. MORETON.

DETROIT WATER WORKS.

METER RATES.

First 3,000 Cubic Feet, each month, each 100 gallons.....	$\frac{3}{4}$ of a cent
All over, each 100 gallons.....	$\frac{1}{4}$ of a cent

ASSESSMENT RATES.

FROM JULY 1st, 1886.

	PER ANNUM
For Family, household purposes.....	\$5 00
Each Additional Family in same house, supplied with one faucet..	3 00
Green Houses.—Special rates.	
Private Stables, for each horse.....	2 00
Livery Stables, " " ".....	2 00
Dray and Team Horses, each.....	1 00
Cows, each.....	1 00
Stores and Offices.....	\$2 00 to 20 00
Bakeries, average daily use, for each barrel of flour.....	3 50
Saloons, Groceries and Provision Stores, from.....	\$2 00 to 100 00
Bar, with faucet, from.....	8 00 to 50 00
Fish Houses.....	10 00 to 100 00
Slaughter Houses.—Special rates.	
Hotels and Taverns, in addition to family rate, each room.....	1 00
Boarding Schools, each room.....	1 00
Public Schools, from.....	\$5 00 to 50 00
Building Purposes, each 1 M brick.....	5
" " " 100 yards plastering.....	10
" " " perch stone.....	11½
Printing Offices.—Special rates.	
Butcher Stalls, each not less than.....	3 00
Workshops, for 10 persons or under.....	3 00
" for each additional 10 persons.....	1 00
Estimated quantities of water each 100 gallons.....	2
Boarding Houses, in addition to family rate, each boarder..	1 00

FIXTURES.

Bath Tubs, for families, 1st tub, \$2; each additional.....	\$1 00
Bath Tubs, public, each tub.....	5 00
Water-closets, for a family, 1st closet, \$3 00; each additional.....	\$1 00
	\$3 00 to 15 00
Water-closets, for Hotels, Stores, Factories, etc., for ten persons, \$5 00; each additional person.....	25
Hot Water-closets, not less than.....	6 00
Urinals, not less than.....	2 00
Wash-Hand Basins, for family.....	\$1 00 to 3 00
" " for other purposes, each person.....	25
Permanent Wash Tubs.....	No Charge
Hose, for lawn and street sprinkling purposes.....	free.
Hose, for other purposes.....	\$3 00 to 20 00
Fountains.....	5 00 to 20 00
Street Sprinklers, each wagon.....	100 00

Where there is a waste of water a proper increase of rates will be made.

REPORT
OF THE
BOARD OF WATER COMMISSIONERS
OF THE
CITY OF DETROIT.

WATER COMMISSIONERS' OFFICE,

DETROIT, January 2, 1895.

To the Common Council of the City of Detroit:

GENTLEMEN—The Board of Water Commissioners respectfully submits its annual report for the year ending December 31st, 1894. The reports of its General Superintendent, its Civil Engineer and the Heads of Departments are presented herewith, giving in detail the operations of the Board, to which your attention is earnestly invited. .

The construction of the new engine, the building of the Hurlbut Memorial Gate, and other general improvements at the Pumping Works grounds, are now completed.

The pumping capacity, with all four engines running, is over one hundred million gallons per day, a condition that will prevent "short supplies," as far as this part of the works is concerned, for some years.

The laying of an additional force main is arranged for and the pipe necessary thereto contracted for, and will be delivered early in the coming year.

The operations of the Board in the past year, especially in the laying of water-pipe, have been conducted largely with a desire to provide work for the unemployed, and much has

been done that was not immediately necessary, because of that. Much of the labor has been furnished by the Poor Commission, and while ordinarily this class of labor is by no means the most profitable, yet we are happy to state that the results obtained are as good as those of former years.

The principle of conducting the Works in the interest of the people, which is to furnish the best possible results at the smallest possible expense, prevails with the Board as strongly as ever; and when it is known that we pumped less water in 1894 than was pumped in 1888, that the population has increased 63,838 in the meantime, that the operating expenses of the Board were but \$800 more in 1894 than in 1888, and that the average increase of pressure throughout the city is full 34 per cent. greater, it certainly seems that the claim is fully established.

In contemplating the laying of the additional force main to the city, the Board saw the necessity of issuing an additional \$100,000 of bonds, under the act of 1873. Under resolution of the Board November 6, 1894, these were advertised, the result of which, though coming in the following year's operations, yet being previous to the date of the submission of this report, we herewith include. The highest bid, and the one accepted, was from Rollins & Sons, of Boston, and was \$111,110. The bonds were gold-bearing four per cents. These are the first bonds issued by the Board since 1881, and in the meantime \$519,000 of outstanding bonds have been redeemed from its resources.

Which is respectfully submitted.

HENRY M. DUFFIELD.
FRANK E. KIRBY,
ALBERT L. STEPHENS,
DEWITT H. MORELAND,
EDWARD W. PENDLETON,

Commissioners.

REPORT

OF THE

GENERAL SUPERINTENDENT AND SECRETARY.

JANUARY 2d, 1895.

To the Board of Water Commissioners:

GENTLEMEN—I herewith respectfully submit my report of the general operations and construction of the Works for the year 1894.

The several departments, under the control and management of the Superintendents thereof, and the operations therein in detail, will be found in accompanying reports. They are of sufficient interest to invite the closest perusal, and indicate, what is a fact, an earnest, intelligent and honest performance of the trusts reposed in them.

In visiting other Works, or in studying the reports of their various operations, I turn with relief to the careful and economic measures of this Department, and reflect with pleasure upon the unanimity that prevails, and the earnest desire to perform their duties faithfully, that actuates the employés of the Water Works of the City of Detroit.

IRON PIPE DEPARTMENT.

The past year has been, in this department, an eventful one. Early in the year the superintendency was vested in the Civil Engineer, with Mr. Bridge as Assistant, in order that the former official might have direct charge of work that was to be performed under a plan which he had recommended to the Board, and which he desired to direct personally. Without entering into a discussion of this question, or giving its history,

I will simply say that the Board determined, after a fair trial, to abandon it, and Mr. Bridge was again placed in charge and the work again proceeded as had been the custom for years.

During the year very much of the work has been conducted with a desire to provide labor for the unemployed; and, in order to reach the greatest number, I have acted under instructions from your honorable body and laid off the men after two weeks' work and taken on new men, largely furnished by the Poor Commission. It was feared that this manner of proceeding would materially increase the expense of laying water-pipe, but by a careful comparison with the cost of former years it was found that there was but little, if any, difference in the cost. The men seemed to make up in eagerness and gratitude for an opportunity to earn a few dollars, what they lacked in experience.

I desire here to make mention of an employé in this department who, by a little ingenuity, saved considerable in the expense of testing pipe in the ditch. The tests usually were made with a portable engine drawn around by horses, and there was substituted therefor, under the suggestion of S. G. Howe, a hand pressure pump, which could be carried around by hand, and, with the addition of certain attachments, was fully as effective in accomplishing desired results as the more cumbersome and expensive steam pump.

The purchasing of horses for doing the hauling of the Board was a wise one, as the gradual and steady increase of this class of work has rendered the time fully ripe for such proceeding. If the teams are kept as busy as the amount of work of the past year would seem to indicate, a saving will be effected in this expense of fully 50 per cent.

The perfecting of the pipe system under the direction of the Chief Engineer has steadily proceeded, until at the present time practically none of the serious deficiencies thereof and their consequent annoyances to the Board and myself seem to exist. The daily complaints of the past, the cause for which I struggled to do away with, but which I only partially accomplished, are now things of the past. It is now a most uncom-

mon thing to receive complaints of short supplies, and they are always found, upon investigation, to be due to local troubles rather than to any fault in the system.

Last August, owing to ever-occurring breakages in the valves of the system, caused by their being operated by inexperienced men in the iron pipe department, I organized a small gang of men under John Bridge and placed all the valves under his direct charge, instructing him to proceed at once to a thorough and systematic examination of them. At my request he has made a report of his five months' operations and which I have appended to my report, as it is full of interesting information.

PUMPING WORKS.

The pumping capacity of the Works is now, with all engines running, over 100 million gallons per day. The engine house, instead of being dwarfed by the additions at either end to accommodate the two engines purchased last, seems to have needed these two extensions to perfect it architecturally; and the condition of the grounds has experienced such a marked improvement as to render them one of the most attractive features of our city.

Chief Engineer Gould has not simply contented himself with doing well with what he had to do with, but has exercised in several instances his inventive genius to improve his conditions. The most marked of these actions was his arrangement by which the engines could be converted in five minutes from "double pumps" to single acting. There is a *minimum* as well as a *maximum* capacity to the engines, and it often happens at night that the minimum capacity is too great, in which event it was customary previously to help along in the great "waste" act by opening the waste gate and letting the surplus run back into the well. The arrangement, which is the result of his thought and study, practically unships one of the pumps, and reduces the capacity of the engine to the volume of water required of it, thereby doing away with any necessity and expense of pumping the water up hill simply to see it run down again.

Mr. Scribner, from being a man who knew little or nothing of landscape gardening, has so perfected himself by study and observation as to need but an inspection of his work to establish the fact as to his knowledge of the art.

There is one thing which I have already called to the attention of your honorable body, and that is the removal of the fence around the settling-basin. It is a cheap picket fence and accomplishing no good whatever except to obstruct the view of the river front. If the Board would but consent to its removal, I think the members would be much surprised at the wonderful improvement that would be produced.

OIL AS FUEL.

In the latter part of 1892 we commenced burning oil. In 1891 and a part of 1892, natural gas was used, the contract being, however, to pay to the company what it would cost on the average with coal. Previous to that time coal was used exclusively.

The following table will give a pretty correct idea of the expense under the various fuels in use for the last six years. It will be seen that the rate per million in 1894 was 12 cents higher than 1893, which is owing entirely to the increased head that the engines are pumping against:

YEARS.	GALLONS PUMPED.	PUMPING EXPENSES.			Cost Per Million Gallons.
		Fuel.	Labor.	Total.	
1889.....	12,875,334,453	\$34,413 81	\$18,999 35	\$53,413 56	\$4 14
1890.....	12,120,944,532	31,768 40	17,635 99	49,399 89	4 07
1891.....	12,067,261,236	33,826 86	16,911 08	50,737 99	4 20
1892.....	12,476,612,482	31,031 40	18,402 42	49,433 82	3 96
1893.....	13,877,977,208	27,479 93	16,571 59	44,051 52	3 18
1894.....	13,649,779,605	29,283 47	15,874 34	45,157 81	3 20

Average of 1889, 1890 and 1891.....\$4.14 per million.
Per Million in 1893..... 3.18

Saving by oil, per million.....\$.96

Amount pumped in 1893, 13,877,977,208; multiplied by 96 cents, gives a total saving for the year of \$13,322.75.

The following statement shows the entire amount expended at the pumping station, including the original purchase of the land, the improvement thereof, the buildings, machinery, etc.:

ITEMS.	Previously Expended.	1894.	Total.
Land	\$85,000 00	.....	\$85,000 00
Force Mains	621,967 69	\$ 2,040 84	624,008 53
Inlet Pipes	90,626 84	185 00	90,811 84
Dock, Basin and Canal	135,309 12	2,101 90	137,411 02
Conduits and Wells	77,670 52	3,791 18	81,461 70
Engine, Boiler and Coal Houses	189,107 12	8,169 84	192,276 96
Stand Pipe and Tower	30,420 72	.....	30,420 72
Pump Wells	54,221 56	.....	54,221 56
Engines	321,655 56	17,039 18	338,694 74
Boilers	54,248 40	462 61	54,711 01
Engineer's House	8,139 75	.....	8,139 75
Sewer	3,666 25	.....	3,666 25
Grounds, Fences and Gate- way	77,522 44	28,717 91	106,240 35
Inspection	2,977 86	.....	2,977 86
Miscellaneous	11,694 80	1,852 87	13,547 67
Totals	\$1,714,228 63	\$59,361 33	\$1,773,589 96

METER DEPARTMENT.

The Superintendent, Mr. Putnam, was placed by the Board in charge of Meters and Inspection in 1890. In 1893 I placed him in charge of the "Service Connections" Department, which includes a surveillance of all the work of plumbers. Last July I placed him in charge of the Repair Department, which afterwards was approved by you. Formerly it was under the Superintendent of Extension, who was obliged so often to be absent on the pipe lines when his services were needed in "repairs," that it became necessary to make a change. All of these duties, thus *loaded* upon him, have been performed excellently, and I have been saved much perplexity and annoyance which were previously my usual diet.

METERS.

The introduction of meters still continues, there having been 722 new ones placed in 1894. The rapidity or volume of the introduction of meters each year has depended, and must still continue to depend, upon the amount of money that the Board could or will be able to spare from its resources. Further, that far from being considered an imposition, as it was the first year, applications *for* them come in now faster than they can be supplied.

The results are of interest. It is a well established fact in regard to water works, that construction and operation expenditures depend largely on the volume of water required to be pumped.

The following table will give some idea of the rapidly increasing *pro rata* consumption while there were practically no meters, and the results that have been obtained since.

HISTORICAL.

The following table is one published last year, with the addition of the results of 1894:

YEARS.	Families Supplied.	WATER PUMPED.		REMARKS.
		Total Quantity.	Per Family.	
1853.....	.....	235,840,275	.....
1853.....	4,238	303,581,743	70,868	
1854.....	4,619	376,265,126	81,460	
1855.....	5,282	542,807,864	102,765	
1856.....	5,708	692,124,305	121,297	
1857.....	6,189	697,190,523	112,650	
1858.....	6,474	718,091,207	110,919	
1859.....	6,794	782,112,587	115,118	
1860.....	6,750	870,036,451	125,185	
1861.....	7,128	895,129,423	125,579	
1862.....	7,275	994,945,329	136,762	
1863.....	7,699	1,035,798,043	134,534	
1864.....	7,993	1,019,390,256	127,410	
1865.....	8,351	1,040,514,887	125,875	
1866.....	9,089	1,196,317,922	131,622	
1867.....	10,242	1,423,535,230	139,186	Average per cent. of increase from 1852 to 1888— 12.86.
1868.....	11,544	1,666,545,125	144,364	
1869.....	12,774	1,946,810,325	152,400	
1870.....	13,723	1,866,060,068	136,000	
1871.....	14,896	2,360,150,605	154,414	
1872.....	16,035	2,782,292,578	173,513	
1873.....	17,019	3,198,393,948	187,930	
1874.....	18,853	3,289,872,635	174,511	
1875.....	19,606	4,207,454,260	214,600	
1876.....	20,102	4,065,134,470	200,225	
1877.....	20,345	4,213,239,790	207,090	
1878.....	20,603	4,345,743,330	210,927	
1879.....	21,341	5,129,599,110	240,348	
1880.....	22,465	5,552,965,310	247,183	Average per cent. of increase from 1879 to 1888, in- clusive, 8.5.
1881.....	23,749	6,543,127,958	279,722	
1882.....	25,442	6,284,000,742	243,062	
1883.....	27,415	7,379,327,788	269,170	
1884.....	29,424	8,510,614,140	289,260	
1885.....	30,533	9,970,829,580	326,886	
1886.....	31,946	10,576,571,254	331,070	
1887.....	34,486	13,168,859,808	381,860	
1888.....	36,863	14,880,166,670	390,098	
1889.....	39,158	12,875,834,453	328,880	Commenced Meter- ing.
1890.....	41,467	12,120,944,532	292,300	
1891.....	43,933	12,057,261,236	274,470	
1892.....	46,400	12,276,612,482	264,582	
1893.....	49,817	13,877,977,208	278,579	
1894.....	49,912	13,649,779,605	278,476	

It will be seen that the quantity pumped in 1894 is practically the same as that of 1887. The population of the city in

1887 was 184,829. The population in 1894 was 258,834, an increase of 74,000—a large city in itself. No innovation in the conduct of public affairs would be acceptable that does an injustice, nor should any attempt be tolerated in the interest of economy that saves for us, either individually or collectively, at the expense of the other interests. Ninety-five per cent. of those metered pay less than under the assessment plan, and while our receipts are thus reduced, at the same time the expenditures for operation and construction are so largely kept down as to more than double—yes, treble—the expense of the meters. This statement is susceptible of proof, and as a part of such evidence I invite your attention to the following table. The third line and the last two lines are the important ones to consider in this connection. The two years previous to the introduction of meters are taken to show that 1888 was not an unusual year:

COMPARATIVE STATEMENT.

	1887.	1888.	1894.
Daily average consumption in gallons	36,079,068	39,387,716	37,306,006
Daily average consumption per capita	195	204	144
Total annual consumption.....	13,168,859,808	14,388,166,670	13,640,779,006
Total consumption through meters..	65,182,000	91,750,000	1,786,378,000
Revenue from unmetered water... ..	\$316,316.30	\$335,140.10	\$344,577.00
Revenue from metered water.....	\$6,518.30	\$9,175.00	\$78,851.07
Per 1,000 gallons metered water....	.10	.10	.041
Per 1,000 gallons unmetered water...	.024	.083	.063
Number of families supplied	34,486	36,863	49,912
Number of service connections.....	32,936	36,609	47,520
Miles of pipe	322	325	626
Number of meters	About 40	48	3,166
Actual operating expenses	\$82,723.74	\$92,475.50	\$93,083.22
* Estimated population.....	184,829	194,966	258,834

* Population estimated by multiplying families in city by 5.14.

It is a very simple matter to take the first table and estimate what the amount of water would have been pumped had no restrictions to waste been adopted. The increase from year

to year previous to 1889 was 8.5 per cent. Upon the supposition that this increase would have continued, which is reasonable, we would have pumped, in 1894, 31,732,901,624 gallons, or considerably more than double the quantity that was pumped, and an average daily supply of 86,939,453 gallons.

This seems rather wild, yet, when one looks at the column marked "Gallons per Family," and examines critically its sure and steady increase; and when one also sees the quantity pumped by Buffalo last year, which was a daily per capita of (*) 325 gallons, the per capita of which city was in 1888 considerably less than Detroit, which was that year 204 gallons, it becomes less problematical; in fact, as certain as any estimate could possibly be.

For the purpose of demonstrating how this has affected the water-rate payers as individuals, I call your attention to another table that is historical.

YEARS.	No. of Families Supplied.	Rates Received for all Purposes.	Average per Family.	REMARKS.
1876.....	20,102	\$ 205,624 74	\$10 23	\$10.21 General Average.
1877.....	20,845	210,288 12	10 33	
1878.....	20,603	208,198 95	10 10	
1879.....	21,341	218,110 13	10 22	
1880.....	22,465	227,452 73	10 12	
1881.....	23,749	241,884 32	10 18	
1882.....	25,442	261,725 79	10 28	
1883.....	27,415	280,049 06	10 21	
1884.....	29,424	300,467 24	10 21	
1885.....	30,533	313,205 10	10 25	
1886.....	31,946	314,952 31	9 86	Family Rates reduced, taking effect July 1st.
1887.....	34,486	322,834 59	9 36	
1888.....	36,863	344,815 26	9 34	\$9.36 General Average.
1889.....	39,158	367,925 27	9 39	
1890.....	41,467	387,877 73	9 35	Hose tax abated, tak- ing effect July 1st. Meter rates reduced to 1/2 of a cent per 100 gallons.
1891.....	43,933	389,079 97	8 85	
1892.....	46,400	402,534 98	8 67	
1893.....	49,817	420,490 83	8 44	
1894.....	49,912	418,728 76	8 39	

I hope this table will not be passed over with the usual glance that tables ordinarily receive. It proves conclusively several important facts. The first *ten* years' statements prove

* See Water and Gas Review, January, 1895.

that, though rates are assessed upon and received from all classes of consumers in a city, if the schedule of rates remain the same, the rates divided by the number of families supplied will produce the same quotient; that is, the average per family will remain the same. The average for ten years preceding 1886 was \$10.21 per family.

Any reduction of rates and its effect on the income of the Board can be almost exactly measured by multiplying the number of families of the year by the average per family previous to the reduction. In 1886 the charge for household purposes for a private family was reduced from a sliding scale of \$5, \$6, \$7, etc., according to the number in the family, to the nominal sum of \$5.00. This took effect July 1, 1886. The average of the four years thereafter was \$9.36, or 85 cents less. Multiplying the number of families of any year by 85 cents will give the reduction of the income consequent. Families of 1890, 41,467; multiplying by 85 cents gives a reduction of income, \$35,246.95.

In 1891 the tax on hose for *lawn and street sprinkling* was abated, taking effect July 1st. At the same time the meter rates were reduced from 10 cents per 1,000 gallons to 6½ cents, then to 5 cents, and finally, October 1st of that year, to 3½ cents, where it now stands. The reductions of 1891, 1892, 1893 and 1894 are not due entirely to these changes of rates, as meters were being constantly placed, almost all of said consumers paying less than under the *assessed* rates. This can, however, be very closely calculated, as the hose reduction was, by a careful examination of the books, known at the time to be about \$20,000 per annum. We make, then, the reductions in income of 1894, as compared to the schedule of rates of 1885, as follows:

49,912 × 85 cents, gives reduction of rates for families.....	\$12,435 00
Abatement of hose.....	20,000 00
Leaving for reductions of meter rates, etc.....	38,445 00
A total of.....	<u>\$90,875 00</u>

This amount was saved to water-rate payers in 1894, and, proportionately, the same amount each year, and still the Board

continues to pay from its resources all expenditures for operation and construction, and a certain portion of its bonded indebtedness.

The last bonds issued by the Board was in 1881, since when it has redeemed from its resources \$519,000 of bonds. It has, however, received from the general tax levy in that time \$963,331.21, of which \$650,000 has gone to pay the interest upon the bond issue of 1873, leaving \$313,331 to assist in the payment of the \$519,000. In this time, therefore, \$205,668 of bonds have been paid from the ordinary resources of the Board, as well as the interest upon all bonded indebtedness outside the issue of 1873.

It is sometimes claimed that where all consumers are not metered it is prejudicial to those using them. This might be the case where the relationship between the assessment and meter rates are not carefully watched and adjusted, as they are in Detroit, so as to make them correspond. In a report from the Water Works of a certain city, I saw that one-fifth the water that was pumped passed through meters, and in another place in same report I saw that the meter rates received was one-half the total receipts. In other words, one-fifth of the consumers paid one-half the income. This is a common feature in the rates of different cities.

By the last table it will be seen that the receipts for metered water was $4\frac{1}{10}$ cents per thousand gallons, and that the receipts for unmetered water was $2\frac{4}{10}$ cents. It must be remembered, however, that the "unmetered" water includes all water that is lost by leaks in supply and distribution pipes, and all water consumed in public parks, by the Fire Department for ordinary consumption and also for fires. This, by careful estimates, is placed at fully 25 per cent. of the whole quantity. Deducting this quantity and dividing rates received by the remainder, we have for each thousand gallons nearly $3\frac{3}{10}$ cents, or one-fifth of a cent less than for metered water. This one-fifth of a cent per thousand gallons is calculated to be sufficient to pay for use and repairs of meters.

If there is anything that works prejudicial to one consumer

as against another, it certainly is the estimating or "guess" plan. In 1889, the placing of meters upon ten prominently large consumers developed the fact that they had been paying all the way from *one cent* per 1,000 gallons up to *twenty cents*. Two different manufacturers, engaged in the same business, one had been paying at the rate of *one cent* and the other at the rate of *six and one-fourth cents*.

Every meter that is put on, establishing the true quantity of water consumed, reduces the discrimination that has always existed under the assessment plan.

SCHEDULE OF RATES.

I have considered it my duty from time to time to recommend to your honorable body, which recommendations have always been adopted, certain reductions in the "meter" and "assessed" rates. In 1890 the meter rates were reduced to 3½ cents per 1,000 gallons, because it was estimated that the cost of pumping, upon the basis of the operating expenses and the interest on the plant, was about 3 cents per thousand. The reductions following, such as the abatement of the hose tax in 1891 and the subsequent change of rates last July, were made simply to maintain a proper relationship between the "meter" and "assessed" rates. The use of the term "free hose" is really a misnomer, as it is considered, or was when the reduction was made, that there was a sufficiently large assessment imposed for household purposes to pay for the water used in sprinkling lawns and streets. This reduction or abatement of charge for lawn and street sprinkling originated from a desire of the Board to reduce the "assessed" rates about \$25,000 per annum. It found that the income from that source was larger in proportion than that from the supply of water through meters; and it also found that the above reduction in its income could be made to the benefit of the water-takers without injury to the works.

Previous to the making of this report, I had written to all of the cities having a population of over 80,000, and requested their meter rates. From those who answered, I have prepared

the following table, that will give valuable information and will show that Detroit practically has the lowest meter rate in the world, with the exception of Washington, which is 3 cents per thousand. Washington water is supplied by gravity, and the construction expenditures to a large extent provided for by appropriations by Congress. Buffalo has but few meters; none where the consumption requires an annual payment less than \$50. It has also what may properly be considered as an aristocracy of prices, as indicated in the table:

CITIES.	ANNUAL PAY- MENT. CONSUMPTION 150,000 GALS. MONTHLY.	ANNUAL PAY- MENT. CONSUMPTION 1,500,000 GALS. MONTHLY.	ANNUAL PAY- MENT. CONSUMPTION 3,500,000 GALS. MONTHLY.
Detroit	\$ 69 00	\$ 609 00	\$ 1,409 00
Chicago	180 00	1,476 00	3,396 00
Milwaukee	282 00	1,075 00	1,915 00
Washington	54 00	540 00	1,260 00
Baltimore	108 00	1,080 00	2,520 00
Kansas City	325 00		
Cleveland	96 00	960 00	2,240 00
Toledo	165 60	1,243 80	2,482 80
Syracuse	270 00	1,080 00	2,520 00
Rochester	180 00	1,800 00	4,200 00
Providence	360 00	2,700 00	6,300 00
Boston	103 00	2,880 00	6,072 00
Cincinnati	162 00	1,620 00	3,780 00
St. Louis	315 00	2,250 00	4,375 00
Alleghany	180 00	1,800 00	4,200 00
Brooklyn	180 00	1,800 00	4,200 00
Indianapolis	204 00	1,500 00	2,940 00
New Orleans	108 00	1,620 00	3,096 00
St. Paul	180 00	1,800 00	4,200 00
Buffalo. {	Factories	50 00	360 00
	Commercial	72 00	720 00
	Elevators	108 00	1,080 00
			2,520 00

FINANCIAL REPORT

BY THE

SUPERINTENDENT AND SECRETARY

FOR THE YEAR 1894.

RECEIPTS.

WATER RATES ACCOUNT—	
Rates paid.....	\$418,738 76
PERCENTAGE ACCOUNT—	
From delinquents.....	7,475 67
Penalties for shutting off.....	506 50
PLUMBERS' LICENSE ACCOUNT—	
Paid for licenses.....	606 15
SERVICE COCKS ACCOUNT—	
Labor and material.....	5,717 19
CITY OF DETROIT ACCOUNT—	
Tax levy.....	78,901 87
REPAIRING LEAKS ACCOUNT—	
Labor.....	116 45
ENGINEERING ACCOUNT—	
Material.....	38
IRON PIPE ACCOUNT—	
Labor and materials.....	24,148 53
Bonus paid for extensions.....	465 63
HURLBUT FUND ACCOUNT—	
Payments from trustees.....	5,100 00
REAL ESTATE ACCOUNT—	
Rentals.....	2,475 00
METEOR ACCOUNT—	
Sale of Material.....	795 30
INTEREST ACCOUNT—	
On deposits general account.....	3,016 51
“ “ sinking fund.....	450 37
LOAN ACCOUNT—	
Loan.....	50,000 00

HORSE AND WAGON ACCOUNT—

Sale of Horse	\$85 00
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PUMPING WATER ACCOUNT—

For water by farmers.....	7 90
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Total receipts	<u>\$592,551 61</u>
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EXPENDITURES.

FOR CONSTRUCTION.

IRON PIPE ACCOUNT—

Superintendent and clerks...	\$7,468 38
Labor	106,521 87
Iron pipe.....	71,263 31
Special castings.....	11,677 62
Tools, and repairing of.....	1,485 32
Hauling	3,108 81
Lumber	1,286 08
Coal.....	335 16
Oil	81 48
Packing	632 70
Lead	9,198 51
Iron cylinders.....	111 00
Plugs ..	91 65
Testing covers.....	63 00
Rubber disc and engine.....	164 84
Repairs, and materials for.....	263 27
Diaphragms	91 80
Repaving	13,594 71
Street car and toll tickets.....	311 02
Livery	72 00
Wagon and harness supplies and repairs...	1,011 62
Feed	1,008 86
Shavings	25 00
Farrier	121 75
Materials	720 81
Stationery, books, etc	178 87
Car rental	1 00
Gate boxes.....	834 52
Clothes spoiled at riot.....	52 56
Guages	21 49
Machine.....	20 80
Horse board	90 00
Brick	1,575 19
Sand.....	186 01

Park and boulevard	\$391 33
Medical and hospital attendance.....	226 00
Freight and express.....	2,504 08
Gate wells.....	1,584 33
Tapping machine.....	1,150 00
Stove	16 80
Valves	9,525 75
Pipe jointers ..	481 41
Revolvers	345 46
Fittings	161 97

\$349,952 57
PUMPING WORKS ACCOUNT—

Labor.....	2,810 75
Cut stone work	373 30
Carving contract.....	600 00
Mason work	871 93
Iron Work.....	1,659 83
Carpenter work	246 46
Hauling pipe	435 89
Painting	187 90
Fixtures	76 30
Horse and cart.....	409 34
Pump cage.....	186 40
Work on engine house	48 84
Meter	331 00
Repairing conduit.....	2,044 09
Fittings, valves, etc	1,444 75
Medical attendance.....	6 50
Work on inlet pipe.....	185 00
Repairs to new well	56 04
Brick	245 75
Architect.....	284 43
Cement	158 50
Material—tools, lumber, etc.....	369 89
Engine contract.....	17,039 18
Rebuilding arch	198 15
New attachments	140 76
Beams	51 54

\$39,341 53
OIL PLANT ACCOUNT—

Reid's burners	160 00
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\$160 00

METER ACCOUNT—

Superintendent and labor.....	\$9,178 45	
Meters	8,795 09	
Freight and express.....	51 08	
Specials and fittings.....	1,056 84	
Horse board and shoeing.....	262 25	
Medical attendance (horse)	2 00	
Repairs to harness and vehicles.....	51 92	
Bicycles	50 00	
Blanket	3 00	
Street car tickets.....	20 70	
Hauling	137 15	
Material—brass, solder, lumber, etc.....	477 10	
Tools, and repairing of.....	12 95	
Printing, stationery and postage.....	54 90	
Meter wells.....	251 51	
		<u>\$20,404 89</u>

REAL ESTATE ACCOUNT—

Insurance	\$299 99	
Repairing boiler	1 96	
Plumbing	80 58	
Repairs to buildings.....	332 81	
Material	15 10	
Building addition to barn.....	1,028 27	
Labor.....	1,599 84	
		<u>\$3,808 00</u>

ENGINEERING ACCOUNT—

Civil engineer and assistants	\$5,894 92	
Materials, instruments, etc.....	779 52	
		<u>\$6,674 44</u>

HORSE AND WAGON ACCOUNT—

Horses	\$1,495 00	
Harness	223 50	
Vehicles and parts thereof	1,350 00	
		<u>\$3,068 50</u>

OFFICE FURNITURE AND FIXTURE ACCOUNT—

Furniture and Fixtures.....	\$281 84	
		<u>\$281 84</u>

Aggregate \$318,191 76

OPERATION AND MAINTENANCE.

OFFICE ACCOUNT—

Secretary, assessors and clerks	\$18,621 88
Watchman and janitors.....	1,293 25
Printing and binding.....	1,149 54
Advertisements and subscriptions	241 80
Supplies—soap, matches, etc.....	42 44
“ stationery	180 53
Furniture and fixtures.....	23 00
Extra services	673 62
Expert examiners	1,451 20
Fuel	414 73
Light	338 34
Postage and telegrams.....	157 80
Germicide	36 00
Ice.....	16 00
Street car tickets....	35 00
Horse board	219 25
Farrier	38 50
Harness and buggy repairs	17 20
“ hardware	3 00
House and furniture repairs ...	20 46
License.....	1 00
Telephone rent	639 99
Premium on guaranty bonds.....	430 00
Overpaid water rates.....	693 50
Refund (Greuner)	7 10
Entertaining Boston officials.....	8 00
Money bag	11 00

 \$26,753 13

PUMPING WATER ACCOUNT—

Engineers and firemen.....	\$15,874 34
Consulting engineer.....	1,110 00
Fuel oil	30,233 42
Coal ...	87 90
Printing, telegraphing, stationery.....	9 14
Supplies—rags, waste, soap, etc.....	315 93
“ valves, gaskets, packing, etc....	346 49
Boiler and machine repairs	218 53
Lubricants.....	413 43
Insurance	400 00
Car rental	4 00
Saws.....	30
Medical attendance	3 50
Repairs to wagon and harness	6 65
Feed, shoeing, etc	33 83

BOARD OF WATER COMMISSIONERS.

25

Street car tickets	\$11 50	
Electric light	6 59	
		<u>\$49,078 50</u>
WATER RATES ACCOUNT—		
Overcharge returned	\$42 73	
		<u>\$42 73</u>
PERCENTAGE ACCOUNT—		
Labor	\$1,842 00	
		<u>\$1,842 00</u>
REPAIRING LEAKS ACCOUNT—		
Labor	\$10,137 81	
Wagon and harness repairs	54 80	
Feed and stabling	270 45	
Farrier	97 50	
Street car and toll tickets	85 00	
Repairing tools	8 70	
Tools and materials	184 32	
Repairing pavement	146 57	
Meals	4 60	
		<u>\$10,989 75</u>
SERVICE CONNECTIONS ACCOUNT—		
Labor	\$6,542 21	
Cart and harness repairs	69 28	
Blankets, etc	18 40	
Cocks and valves	2,211 66	
Farrier	55 75	
Material	126 39	
Special taps	43 50	
Horse board	25 00	
Toll and express	1 60	
		<u>\$9,093 79</u>
INSPECTION ACCOUNT—		
Labor and material	\$3,891 02	
		<u>\$3,891 02</u>
PLUMBERS' LICENSE ACCOUNT—		
Licenses returned	41 00	
		<u>\$41 00</u>
METER REPAIRS AND EXPENSES ACCOUNT—		
Fittings, etc	\$126 22	
		<u>\$126 22</u>
Aggregate		<u>\$101,352 14</u>
BONDED INDEBTEDNESS ACCOUNT—		
Bonds paid	\$25,000 00	
		<u>\$25,000 00</u>

LOAN ACCOUNT—

Loan paid.....	\$50,000 00	\$50,000 00
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INTEREST ACCOUNT—

Interest paid.....	\$65,487 65	\$65,487 65
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PARK AND BOULEVARD COMMISSION—

Laying pipe Belle Isle Crossing	\$797 25	\$797 25
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HURLBUT FUND ACCOUNT—

Superintendent, librarian and labor.....	\$7,447 53	
Plants, trees, flowers, fertilizers, etc.....	237 30	
Tools and materials	261 47	
Horse feed, etc.....	72 47	
Memorial gateway (part)	19,729 58	
Lumber.	10 99	
Excavating canal	2,101 90	
Towing lighter	72 00	
Hose, etc.....	28 98	
Toll	2 15	
Cement	5 50	
		\$30,019 81

RECAPITULATION.

Construction expenditures.....	\$318,191 76
Operation and maintenance expenditures	101,352 14
Bonded indebtedness.....	25,000 00
Loan account.....	50,000 00
Interest	65,487 65
Park and Boulevard Commission.....	797 25
Hurlbut Fund	30,019 81
Aggregate	\$585,848 61

ACTUAL OPERATION EXPENSES.

The actual operating expenses are the foregoing expenditures for operation, less the credits by cash received for said expenditures, and are as follows:

Office account.....	\$26,752 18	
Pumping water.....	49,078 50	
Water rates.....	\$42 78	
Overpaid amounts returned.....		
Percentage.....	\$1,842 00	
Receipts, percentages and fines.....	7,984 17	
Repairing leaks.....	\$10,989 75	
Receipts for services.....	116 85	
		10,872 90
Service connections.....	\$9,098 79	
Receipts—services and material.....	6,825 84	
		2,272 95
Inspection.....	8,891 02	
Plumbers' licenses—payments returned.....	41 00	
Meter repairs.....	126 22	
Total.....	\$98,025 23	

RECEIPTS OF WATER RATES BY DISTRICTS.

YEAR.	1st DISTRICT, 9th AND 10th WARD.	2d DISTRICT, 11th AND 12th WARD.	3d DISTRICT, 1 AND 2 WARD.	4th DISTRICT, 3 AND 4 WARD.	5th DISTRICT, 5 AND 6 WARD.	6th DISTRICT, 10 AND 11 WARD.	7th DISTRICT, 4 AND 5 WARD.	8th DISTRICT, 8 AND 9 WARD.	METRES.	AGGREGATE.
1888-9						\$3 75				\$3 75
1889-90			\$1 25			1 25				2 50
1890-1			5 00			5 00				10 00
1891-2	\$1 88	\$3 50	\$55 50			10 00				72 88
1892-3	14 75	24 25	30 50	27 50	\$336 75	77 75	\$36 75	\$60 75		590 00
1893-4	22,498 66	18,453 13	24,122 96	21,841 18	26,021 39	19,552 54	23,863 10	19,380 85	\$38,649 50	308,775 51
1894-5	23,457 65	17,749 06	22,365 78	20,294 23	24,898 85	18,993 21	22,317 83	18,963 46	40,201 57	209,365 63
Total	\$45,997 94	\$36,237 94	\$46,574 04	\$42,171 65	\$51,351 39	\$38,643 50	\$45,706 17	\$38,305 06	\$73,851 07	\$418,798 76

CERTIFICATE OF EXPERT ACCOUNTANT.

DETROIT, January 31st, 1895.

To the Honorable Board of Water Commissioners, City of Detroit :

GENTLEMEN—I have made an examination of the books and vouchers of the Detroit Water Works for the year ending December 31, 1894, and hereby certify that the following statement is correct:

CASH STATEMENT.

1894.	
Jan. 1, Cash on hand.....	\$4,748 48
Commercial National Bank Balance,	
General Fund.....	33,450 22
Commercial National Bank Balance,	
Secretary's Fund.....	500 00
Dec 31, Receipts 1894.....	592,551 61
	<u>\$631,250 31</u>
1895.	
Jan. 1, Cash on hand.....	\$5,978 94
Commercial National Bank Balance,	
General Fund	38,923 76
Commercial National Bank Balance,	
Secretary's Fund	500 00
Disbursements 1894.....	585,848 61
	<u>\$631,250 31</u>

Respectfully submitted,

J. A. M. MORETON,

Auditor.

FORTY-THIRD ANNUAL REPORT OF THE

ASSESSMENT 1894-95.

Dist.	WARDS.	FAMILIES.				Increase Supplied.	ASSESSMENT.		
		Supplied.	Not Supplied.	Whole Number.	Vacant Tenements.		1894-95.	Increase + Decrease.	Transferred to Meter Rolls.
1	Ninth.....	5,137	18	5,155	208	53	\$27,498	-\$2,220	\$27.4
	Fifteenth.....	2,700	81	2,781	118	262	16,977	1,473	262
	Totals.....	7,837	99	7,936	326	300	44,475	— 815	667
2	Eleventh.....	2,481	21	2,502	160	25	20,844	— 904	226
	Thirteenth.....	2,449	16	2,465	100	94	14,647	— 152	224
	Totals.....	5,930	37	5,967	260	129	35,491	— 1,056	250
3	First.....	2,493	8	2,501	197	11	25,229	— 2,142	795
	Seventh.....	3,225	27	3,252	196	60	18,500	— 2,221	615
	Totals.....	5,718	35	5,753	393	49	43,729	— 5,424	1,410
4	Third.....	2,207	10	2,217	120	64	19,457	— 2,226	847
	Fifth.....	2,670	5	2,675	124	49	21,228	— 1,409	446
	Totals.....	4,877	15	4,892	244	15	40,685	— 3,635	1,293
5	Second.....	2,010	12	2,022	147	0	24,509	— 2,029	1,211
	Sixth.....	2,422	6	2,428	257	40	24,254	— 1,020	471
	Totals.....	4,432	18	4,450	404	40	48,763	— 3,719	1,682
6	Tenth.....	4,026	8	4,034	163	12	24,527	— 541	224
	Fourteenth.....	2,259	25	2,284	122	70	13,252	— 155	142
	Totals.....	6,285	33	6,318	285	58	37,779	— 696	366
7	Fourth.....	3,031	4	3,035	220	221	25,454	— 2,128	1,047
	Twelfth.....	3,069	5	3,074	215	75	18,022	— 772	177
	Totals.....	6,100	9	6,109	435	296	43,476	— 2,900	1,224
8	Eighth.....	2,154	9	2,163	231	3	21,226	— 1,120	322
	Sixteenth.....	2,543	143	2,730	141	22	14,718	— 449	24
	Totals.....	4,697	152	4,833	372	19	35,944	— 1,569	346
Aggregate		49,912	445	50,357	2,734	95	\$321,524	— 20,944	\$7,922

It will be seen by the foregoing table that there is a decrease of \$20,946 from the assessment of 1893.

This is caused, first, by assessments amounting to \$7,828 being taken from the rolls because of being metered.

The principal cause, however, was the reduction in the rates made by the Board April 11th, to take effect July 1st, which were as follows:

Additional closets to first, reduced from \$2.00 to \$1.00.

Charge on stationary wash tubs of \$2.00, for private families, abated entirely.

Additional families over first family in same house and supplied through one faucet, to be reduced from \$5.00 to \$3.00.

By a careful inspection of the rolls, this reduction was estimated to be

On closets.....	\$4,200 00
On wash tubs.....	5,326 00
On families.....	10,812 00
Total	<u>\$20,238 00</u>

Upon the basis, therefore, of what was left on which to make assessments, there was really an increase of \$7,120.

The increase of 95 families shows that the city did not exactly stand still under the effects of hard times.

WATER WORKS BONDS.

The following table shows the whole history of the bonded transactions of the Board, in which will be seen that the total amount of bonds issued is \$1,850,000, of which \$717,000 have already been redeemed, leaving outstanding \$1,133,000, upon which there is an annual interest of \$69,070.

DATE OF ISSUE.	DATE PAID UP.	ISSUED.	PAYABLE.	AMOUNT.	RATE OF INTEREST.	REDEEMED.	OUTSTANDING.
1st	1853	Aug. 1, 1853	Aug. 1, 1883	\$100,000	7cts.	\$100,000	—
"	"	"	Aug. 1, 1878	100,000	7 "	100,000	—
"	"	"	Aug. 1, 1873	50,000	7 "	50,000	—
2d	1860	Aug. 1, 1860	Aug. 1, 1890	100,000	7 "	100,000	—
"	"	June 12, 1865	Aug. 1, 1895	100,000	7 "	100,000	—
"	"	"	Aug. 1, 1880	50,000	7 "	50,000	—
3d	1867	Aug. 1, 1858	Aug. 1, 1868	150,000	7 "	150,000	\$50,000
"	"	Aug. 1, 1867	Aug. 1, 1897	100,000	7 "	100,000	—
4th	1869	Feb. 1, 1870	Feb. 1, 1900	100,000	7 "	—	✓ 100,000
5th	"	Aug. 1, 1872	Aug. 1, 1902	50,000	7 "	—	✓ 50,000
6th	"	Aug. 1, 1873	Aug. 1, 1903	50,000	7 "	—	✓ 50,000
"	1873	Feb. 1, 1874	Feb. 1, 1904	50,000	7 "	9,000	✓ 41,000
7th	1869	Aug. 1, 1874	Aug. 1, 1904	50,000	7 "	6,000	✓ 44,000
"	1872	"	"	300,000	7 "	—	✓ 300,000
"	"	June 1, 1875	June 1, 1905	150,000	7 "	1,000	✓ 149,000
"	"	June 1, 1876	June 1, 1906	200,000	6 "	1,000	✓ 199,000
"	"	Sept. 1, 1880	Sept. 1, 1899	100,000	4 "	—	✓ 100,000
"	"	April 1, 1881	April 1, 1907	100,000	4 "	—	✓ 100,000
"	"	Dec. 1, 1880	Dec. 1, 1908	50,000	4 "	—	✓ 50,000
				\$1,850,000		\$717,000	\$1,133,000

The \$50,000 of bonds "outstanding" of the issue of Aug. 1st, 1858, are collateral for loan due Feb. 7th, 1895, at which time it is the intention of the Board to retire them.

One hundred thousand dollars will be issued early in the year in accordance with a resolution of your honorable body Nov. 6th, 1894.

This issue is made necessary by the laying of a new force main from the pumping works, estimated to cost \$160,000.

In closing, I desire to commend the subordinate employees of the works, and particularly those engaged in the receiving of money, generally for their kind and considerate manner to

water rate payers, and also for the willingness with which they have performed their arduous duties.

A position in the water office is usually regarded as "a soft snap," but if any one will spend a few hours, or days, in our "bee hive" and see the amount of work these officials perform, and the hours each day that they devote to it, the contrary fact will become very apparent.

All of which is respectfully submitted.

L. N. CASE,

General Superintendent and Secretary.

REPORT OF SUPERINTENDENT OF GATES.

DETROIT, January 2, 1895.

L. N. Case, Gen'l Superintendent and Secretary Detroit Water Works:

DEAR SIR—In compliance with your request, I respectfully present for your consideration my report of Gates examined and repaired, together with a statement of gate wells built and well covers adjusted to conform to a new pavement or grade, also repairs made to sewers that were necessarily cut into by the operations of pipe laying.

WELLS BUILT IN 1894.

106 by contractor Goodenow, \$1,584.82; covers, \$597.84.....	\$2,182 16
445 by Detroit Water Works, (day work).....	7,845 78
551 wells. Total.....	<u>\$9,527 94</u>
172 well covers adjusted and 19 sewers repaired.....	<u>\$ 310 50</u>

The well covers heretofore used are not adjustable to the grade of the street, only by adding to or removing the brick work of well, which is costly and annoying, as it is difficult to get to do it as promptly as we would wish. I therefore suggest that an adjustable well cover be used which would obviate the difficulty and expense, if one is found practicable. I have already designed a model of a cover which will, I think, answer the requirements, and which I have submitted to you for examination.

In this connection, however, I would respectfully recommend that in future wells be built only over gates that are in paved streets and out of order, as in unpaved streets the grade is not well established, or a deep ditch may be on each side, in which case an iron box will answer every requirement.

While on the subject of gate wells, I would say that the examination of the large gates has disclosed the fact that many of the timbers covering the wells built over them are very much decayed and consequently unsafe. During the latter part of 1894, I removed the timbers and built brick arches over five of the worst ones, and as soon as the season opens for work in the spring, I would suggest that the remainder be put in good and safe condition.

About the middle of last August, I was ordered by you to examine all the gates in the system and to repair such as were out of order. As the operating of gates is one of the most serious and important duties to be performed in a water works, it was with considerable trepidation on my part that I undertook its performance. I sent out two gangs, one east and one west from Woodward avenue, both of them to work north from the river to the gates south of the upper 42-in. and 30-in. in Canfield, Calumet and Buchanan, and from Vinewood to St. Aubin avenues.

This somewhat extensive district apparently has lately received but little attention, so far as gates are concerned, as our examination disclosed a large number either broken, shut, or not conforming to the established uniformity as to size of head of spindle, etc. I therefore proceeded to repair them as fast as possible, as this district is densely built up, and in which there are a large number of wood-working establishments and lumber yards; but severe cold weather in November compelled a cessation of this work, as the ground was soon frozen to a depth of 18 or 20 inches, but we are at the present time repairing gates that are in wells, and cleaning the snow and ice from over the main gates.

Below please find a statement of gates that have been examined, repaired, etc., up to Dec. 31st.

Whole number examined and tested.....	2,689	
In good order.....	2,188	
In good order, but shut.....	128	
Broken and shut.....	171	
In bad order.....	257	2,689

Opened.....	123	
Repaired and opened.....	171	
Repaired.....	169	
To be repaired....	88	
In good order.....	2,138	2,889
Discontinued 3 gates and set 2 new ones.		

These have been reported to the Extension and Engineering Departments.

Our work, examining gates, discloses a large percentage of decayed wood boxes, and some iron ones that are filled with sticks, stones, etc., or not up to grade.

To be able to work a gate properly, it is imperative the box should be clear, and to clean them out the box must be dug up. What has been done in this will be found below.

Decayed wood boxes.....	107
Iron boxes filled up.....	19
Wood boxes replaced with iron.....	36
Iron boxes cleaned out.....	19
Iron boxes set to grade.....	53
Cost—labor, gates and boxes.....	\$1,156 24

All of which is respectfully submitted,

JOHN BRIDGE.

REPORT OF THE CIVIL ENGINEER.

January 26, 1895.

To the Honorable Board of Water Commissioners of the City of Detroit :

GENTLEMEN—In conformity with the regulations governing this Department, the Civil Engineer presents for your consideration the following annual report :

The work of the year just past has been so intimately connected with that of 1893 that the two must be, in a measure, considered together. While it is the province of the various heads of departments to consider parts of our system, the Civil Engineer has to deal with it in its entirety.

Scientifically, our system is regarded as a machine, of which the intake conduits, the boilers, the engines, the distribution system, the fire hydrants, even the plumbing and fixtures in the buildings of our consumers are but parts of a complete whole. The purpose of every machine is to do work or to transform energy. Our machine changes the latent powers of the fuel to the active forces of the jets of water that flow from our penstocks. In every machine there are certain losses of operation which render it impossible to get back as much energy as is put in, and it is the effort of the designer to reduce these losses to as small an amount as possible. The quotient obtained in dividing the work extracted by that put into a machine is called its *efficiency*.

The theoretically perfect machine would be so adjusted that every part should work with its maximum efficiency at the same time. In practice, it often happens that this is impossible, and in water works construction especially we frequently find that when one part of the machine is affording maximum economy, another part may be working at its worst. For every machine, simple or complex, there will be certain conditions of

operation which will produce maximum efficiency, and any variation from these conditions will result in diminished economy. The work of machines is usually measured by the foot-pound, which is the amount of energy expended in raising one pound of matter one foot high against the force of gravity. The losses in a water works system may be classed under two heads: losses due to overcoming the elevations of the territory supplied, and losses due to frictional resistances in the pipes. The former will change only with the quantity of water elevated, while the latter will also be affected by the velocity of flow. In our system, during the past year, less than one-half of the work done by the engines was delivered to the consumers in a form to be utilized. Of the quantity lost, which ranged from about 45 per cent. to 65 per cent. of the whole, a nearly constant portion, averaging about 36 per cent. of the whole, was used in overcoming the elevations of the system, while the remainder, averaging 16 per cent. of the whole, was consumed by friction. As we cannot change the location of the city, the work expended in the former case cannot be reduced, except by lessening the consumption of water, but the losses due to the latter cause may be decreased within certain limits, by proper modifications and manipulations of the distribution system, though they can never be wholly eliminated.

In order to thoroughly understand the investigations embodied in this report, it is necessary that the sources of the information and the method of utilizing it be explained. To begin with, the work that our engines have to do is to take the water from the level of its surface in the pump wells and elevate the necessary quantity to such a height, or give to it such a pressure, as will enable it to flow to the points at which it is consumed, and have remaining a sufficient head or pressure for the purposes of its use. At the engines an hourly record is kept of the quantity of water pumped—measured by piston displacement—and of the pressure pumped against. When these quantities are multiplied together, the product measures the work done by the engines. It is therefore seen that increasing either the pressure pumped against or the quantity

pumped increases the work, and that as much work is required to pump one million gallons of water against fifty pounds pressure as to pump two million gallons against twenty-five pounds pressure. There is also kept a record of the quantity of fuel consumed, and by dividing the work done as deduced above by the number of gallons of oil burned, the work per gallon of oil is obtained. From this it may be determined which engine or which boilers or what method of burning gives the best results.

For the purpose of obtaining the amount of work that our system is delivering to the consumers, as well as to have notice of any localities deficient in pressure, there have been established at various points about our system, mainly in fire-engine houses, pressure gauges connected to our mains, from which readings are recorded every hour. Each gauge is then taken as representing a district, whose area is determined by the topography and the arrangement of our mains. If now the pressure on each gauge be multiplied by the area of its district, and the sum of the products so obtained be divided by the sum of the areas, the result will be an average pressure for the city. The locations of the several gauges are shown by the double circles on the map opposite page 52. In these investigations for want of a more accurate basis of computation it has been assumed that the consumption of water is uniform throughout the area of our city. Owing to the situation of our pumping plant with reference to the center of the system, from which it appears that about the same quantity of water will be consumed between the works and the place of maximum consumption, as will be consumed beyond the latter point, and because the distance from the engines to the center of the district of maximum consumption is very nearly a mean between the distances to the centers of the districts east and west of it, the above assumption may be shown to be reasonably accurate as regards total or average results. On this assumption, if now the quantity of water pumped be multiplied by the average pressure above obtained, the product will be the Usable Work of the system, or that which may be utilized

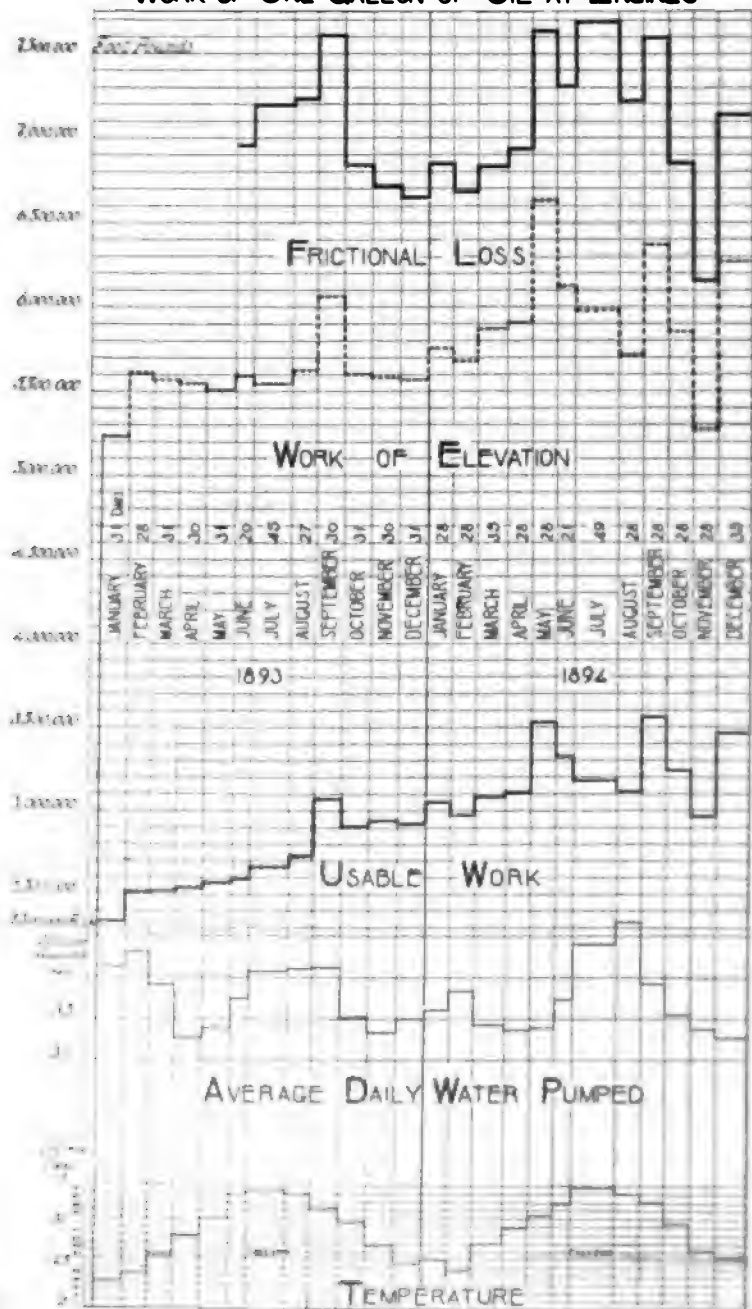
for the purposes of the consumer. Further, if the elevation of each gauge above the river be multiplied by the area of its district and the sum of these products be divided by the sum of the areas, the quotient will be the mean or average elevation of the system; and when the quantity of water pumped is multiplied by this mean elevation, the product is the Work of Elevation. If, from the total work of the engines, the sum of the Usable Work and the Work of Elevation be subtracted, the remainder will be the work expended in overcoming frictional resistances. In making the computations for the data herein, the work of the engines has been figured for two periods each day, and these results together with the gauge readings have been averaged by weeks.

Turning now to Plate I, page 42, the area included between the top irregular line and the bottom of the plate represents the *work of the engines* for the periods indicated near the middle of the plate. The area between the same line and the broken line below it, represents the *work of overcoming friction*. The area between this broken line and the full jagged line next below, represents the *work of elevation*. The area between this last jagged line and the bottom of the plate, represents the *usable work*, all upon the basis of the work of one gallon of oil. The lowest irregular line of the plate shows the mean temperature, and the irregular line next above gives the average number of gallons of water consumed daily. Considering now the first mentioned line, the ordinates to it from the base of the diagram give the average daily work of one gallon of oil at the engines for the various periods. This line, it will be noted, begins June 1, 1893; previous to that time no continuous record of the head pumped against at the engines was kept, hence it is impossible to carry the line back of that point. The first manipulations leading to the readjustment of the distribution under the direction of your Engineer took place in March, 1893, and as described in the Report of last year resulted in a slight improvement in the condition of the system. No further changes were made until June 20th following, so that the record of the first twenty days of June

may be taken as a fair representative of the period preceding. It is seen at once by the rise in the top line that after the latter readjustment, the work performed by each gallon of oil was materially increased. This increase continued through August, and in September there is a still further increase, which is to be accounted for by the fact that two engines were run at full capacity during the night for most of the month, and the excess water so pumped was wasted into the well. Experiments since that time indicate that the probable amount of water so wasted was between one and two million gallons each night. In October, owing to the decreasing consumption and the colder weather, which latter required the use of oil for heating, the work began to decrease and continued so to do for the same reasons, until the close of the year. About the first of January, 1894, the pressure was increased on the down-town system, and this, together with a slight rise of temperature, as shown by the bottom line of the diagram, accounts in a measure for the increased work of the oil in that month. In February, extremely cold weather again lowered the line, which the warmer temperature of March raised to and above the former point. The same cause accounts for the gain in April, and in May a slight increase in pressure and the running of the new engine combined to produce a marked favorable effect. In June, although the quantity of water pumped considerably increased, the fact that Engine No. 4, the new engine, did not run, and other undetermined causes, reduced the work of the oil. July was the banner month at the pumping station. The quantity of water consumed required the running of the engines much of the time at their most economical rates, and the same conditions seem to have held in August, so that the drop in the line for the latter month appears to be one of those occurrences so frequently met with in experimental work which seem to baffle explanation. A part of the difference may be explained by the fact that Engine No. 4 ran in July a portion of the time and not at all in August, but beyond this no reason is apparent. In September, Engine No. 4 again ran and a more even demand for

Plate 1.

WORK OF ONE GALLON OF OIL AT ENGINES



water assisted in bringing the efficiency to near its maximum. Cooler weather and a decreasing consumption, causing the engines to be run at less economical rates, together with the idleness of Engine No. 4 during most of both months combined to lower the line by successive steps in October and November. The working of the new engine, which ran more than thirty days out of the thirty-five credited to December, accounts for the increased economy with which the year closed.

From the foregoing it appears that the running of Engine No. 4 tends to greatly reduce the fuel bill. A closer examination of the records shows that when two engines are running and doing equal amounts of work, if Engine No. 4 is one of them, the fuel consumed is nearly 20 per cent. less than when it is not. This means that if all our engines were as economical as the new one, our fuel bills would be only about 60 per cent. of what they are at present. The cost of fuel for 1894 was \$29,283.00. During the year Engine No. 4 has run less than one-fourth of the time. If, while running, it caused a saving of 20 per cent. the total saving due to it would be 5 per cent. of the year's fuel, so that if it had not run at all the fuel bill would have been over \$30,000.00. A saving of 40 per cent. of this would amount to \$12,000.00, which at 4 per cent. is the interest on \$300,000.00. This sum would be just about sufficient to replace the three old engines and their boilers, and if this were done the saving in fuel would pay the interest on the investment, leaving the proceeds of the sale of the old machinery as clear gain. It will be noted, however, that during the greater part of the year one engine, in addition to the new one, is sufficient for the demand. Such an additional engine could be obtained and housed for about \$125,000.00. The interest on this at 4 per cent. would be \$5,000.00. By such an arrangement a saving in fuel of about \$10,000.00 per year would be effected, leaving a net gain of \$5,000.00 per year after the interest on the investment is paid to apply on the cost.

Referring again to Plate I, page 42, the ordinates to the full irregular line about the middle of the diagram, measured

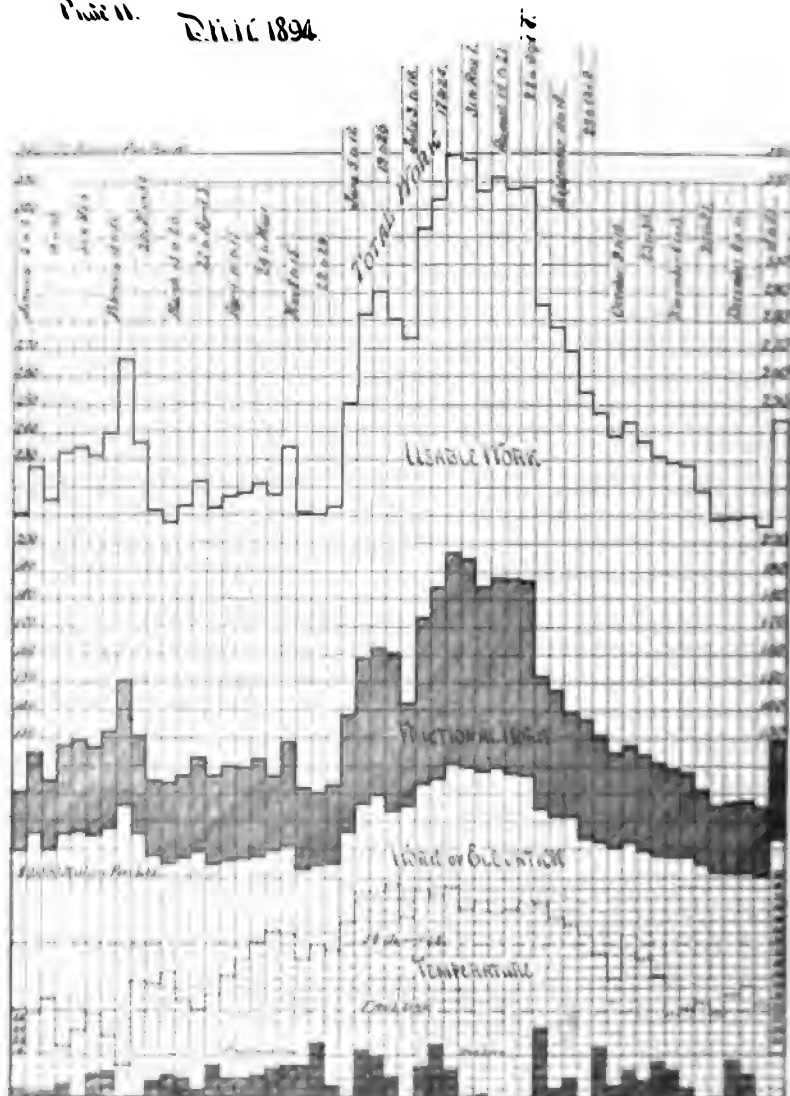
from the bottom of the plate represent the average daily Usable Work of one gallon of oil at the indicated periods, beginning with January, 1893. It will be noted that there is an abrupt increase in this work in February, the cause of which is not wholly apparent from the information at hand. From February to August there is a steady gain in the work of the oil, due partially to the warmer weather and to the manipulations of the system in March and June before mentioned, as well as to some changes in the methods of burning the oil. In August the rise is to be accounted for largely, if not wholly, by the completion of the Michigan avenue twenty-four-inch line. The record for September, from the explanations previously given, is erroneous as to the Usable Work, for a part of the water figured as used was in reality wasted at the engines, and if a correction were made for this it would bring the line for the month to about the same position as that of the month preceding, which would be in entire harmony with other data. The October line shows an increase in the Usable Work over August, due to the completion of the Park street extension, and the fact that less water being pumped, the frictional losses were less, and consequently the pressure on the distribution, though not on the engines, was increased. In November the decreasing friction tended to more than compensate for the colder weather and reduced pumping, and the line rises above that of October. It will here be noted, that while the Usable Work of the system per gallon of oil has increased, the work at the engines has decreased. This is due to the decrease in frictional resistances. The increasing colder weather in December caused the line of Usable Work to fall with that of the work of the engines. In January, February, March, April and May, 1894, the fluctuations in the lower line are but the reflections of those of the upper line. In June increasing consumption increased the friction, and hence reduced the head over the city, so that the Usable Work was decreased for the month, and still further fell in July and August, when the maximum quantity of water was pumped. It is worthy of notice, that while the work of the oil at the engines was not materially

greater in June and July, 1894, than in the same months of 1893, the Usable Work shows a very decided increase which can only be accounted for by the improvement of the distribution system. September, October, November and December, on account of decreasing consumption and reduced friction, show gains in the Usable Work, and close the year with an increase of 48 per cent. since the beginning of 1893. Comparing June, '94, with June, '93, there appears an increase in the Usable Work per gallon of oil consumed of 28 per cent., of which 5 per cent. was at the engines, and 23 per cent. in the distribution. Comparing December, '94, with December, '93, there is a gain of 18 per cent., of which 7 per cent. was at the engines, and 11 per cent. in the distribution. Again, comparing the system at times of maximum consumption, July, '94, and July, '93, shows an increase of over 19 per cent., of which 7 per cent. is at the engines and 12 per cent. in the distribution system. Now, comparing the frictional areas for the several months of 1894 with those of 1893, it will be seen, that in every case, except July, the friction has been decreased, and that it was not decreased in July was due to the enormous quantity of water forced through our system during that month. The entire work of the system, by weeks, for 1894, is shown by Plate II, page 46. These results reflect great credit upon the management at the pumping station, and had it not been for the cordial co-operation of the Chief Engineer such satisfactory ones could not have been obtained.

The operations which have led to these improvements in our distribution system were partially described in the Report of last year. The continuation of the work this year has embraced the curing of about one hundred and fifty pre-existing dead ends, the making of over thirty connections between mains previously crossing, but not connected, the laying of a sixteen-inch cross-town line, with ten-inch and eight-inch branches in the northern part of the city, and a twelve and ten-inch line, with eight-inch branches connecting the Mullett street and the Watson street mains ; all of which construction, including that of 1893, except the connections, and mains less

Part II.

REVENUE 1894.

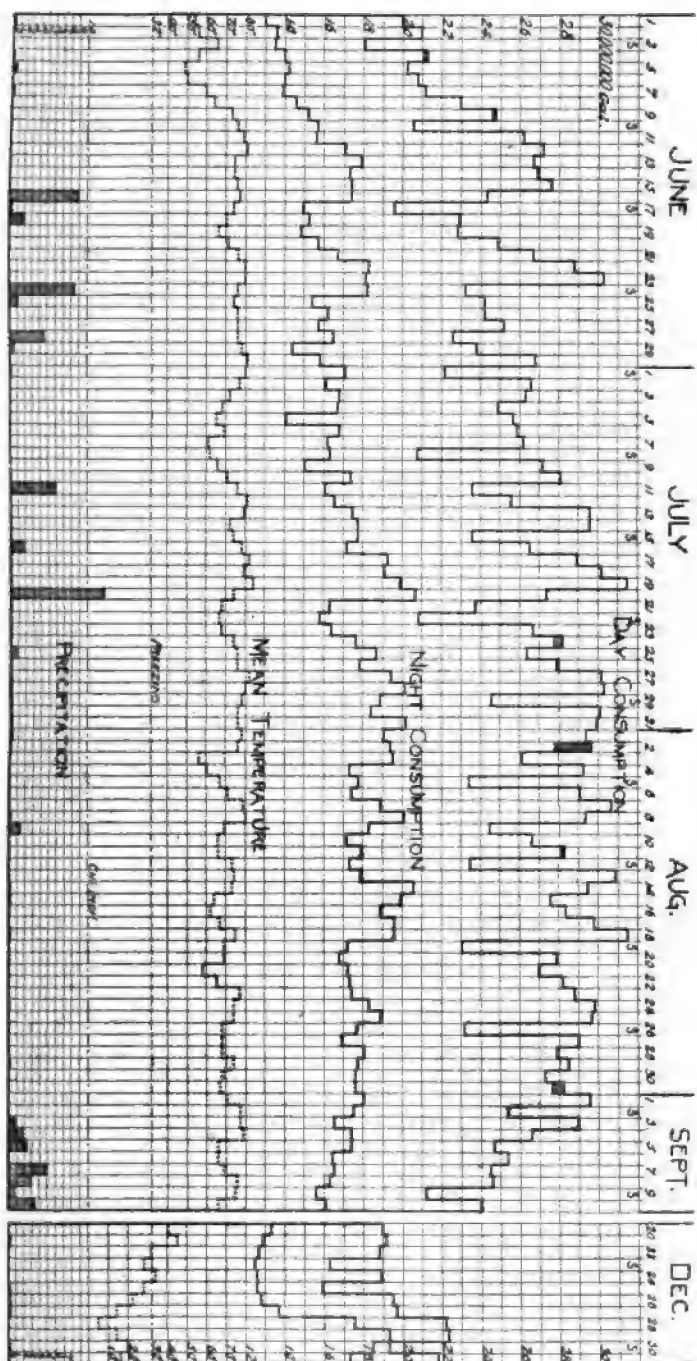


than eight inches in size, is shown by broken lines on the map opposite page 52. There has further been completed, during the year, under your Engineer's supervision the laying of the ten-inch main for the supply of Belle Isle Park, the laying of

an eight and six-inch extension in the township of Grosse Pointe, to the grounds of the Detroit Driving Club, and beyond to the Marshland road, and in the township of Hamtramck, a six-inch extension on the Norris Plank Road to Forest Lawn Cemetery. Some changes in the strainers of the intake conduits, and in the strainer wells at the pumping station, as well as some alterations in the suction conduit of the new engine, were also, in part, carried on under his direction, all of which come more properly in the reports of other departments.

An investigation into the conditions of flow in our distribution, demonstrated that, at the period of minimum consumption, the average head expended in overcoming the frictional resistances of the entire system was a little less than eight *per cent.* of the whole head pumped against, and at times of maximum draught this was increased to thirty *per cent.*, while the average for the year has been about sixteen *per cent.* Of this, in all cases, two-thirds is lost in that part of the system east of Mt. Elliott avenue. The frictional loss between the engines and Mt. Elliott avenue is greater than that from Mt. Elliott avenue to the intersection of Grand River avenue and Sixteenth street. The existence of these conditions, together with the fact that if one of the two forty-two-inch mains now conveying the water to the city should be disabled, the other would be inadequate to protect the city in case of fire, or even to supply the full domestic requirements, led to the recommendation of an additional force-main from the pumping station, which is to unite with the present system at the intersection of Champlain and Chene streets, thus providing for a stronger flow of water through the Mullett street thirty-inch main and its branches in the district midway between the former upper and lower mains. Owing to the demands for increased pressure in the business portions of the city, the former low service has been practically done away with east of Sixth street, so that no gates are now kept closed in the system except those along the 130-foot contour line running northwest from the intersection of Bagg and Sixth streets, as shown on the map opposite page 52.

We now come to the consideration of the water consumed. This at some periods of the year is very intimately affected by the temperature, and also at certain times by the amount of moisture precipitated from the atmosphere. While during the spring and fall the effect of the temperature is insignificant, it becomes more noticeable when the mercury rises above 55 deg., Fahr., or falls below the freezing point. In the former case the consumption is increased by lawn and street sprinkling, and in the latter by consumers leaving the fixtures open in order that the water may be kept in motion and thereby prevented from freezing in the service pipes. During the cold weather, as might be expected, the precipitation has no very apparent effect on the consumption, but during the hot months a rain or hail storm will very materially decrease it. To consider these effects more closely, refer to Plate III, page 49, in which the ordinates measured from the base of the diagram to the top line show the quantity of water consumed during the twelve hours from 7 A. M. to 7 P. M., and ordinates to the second line represent the consumption during the twelve hours of the night preceding. The lowest irregular line gives the mean daily temperature, and the small cross-hatched areas at the bottom show the amount of precipitation. Following the lines of consumption on the plate and neglecting Sundays which are marked S, it is seen that the fluctuations of the day and night consumption follow very closely the variations of temperature. The effect of rain may be especially noted on June 16, July 10 and 20, August 9 and September 3 to 9, in all of which cases the change of temperature was slight. A consideration of the effect of the storm on July 20 gives an idea of the quantity of water that may be used for sprinkling and like purposes. The difference in consumption between Thursday, July 19, and Saturday, July 21, due almost entirely to the storm of July 20, and resulting fall of temperature, was nearly eleven million gallons. As a rain would not be likely to affect any other consumption than that for lawn and street sprinkling and cooling purposes this quantity must be very nearly the amount so used. Eleven million gallons is nearly half the daily capacity of the



DETROIT WATER WORKS
CONSUMPTION TEMPERATURE
1884

Plate III.

new engine, is more than one-third of the entire average daily consumption during some of the spring and fall months, is nearly one-ninth of our entire pumping capacity, and is equal to the entire average daily consumption that would be required for all domestic and manufacturing purposes if there were no waste.

The effect of cold weather is shown at the extreme right of the diagram where comparing the consumption of Saturday, Dec. 22, when the mean temperature was just at freezing, and that of the Saturday following when the mercury averaged about 13 degrees above zero, Fahr., we find a difference of ten million gallons in the consumption of the twenty-four hours. There is this distinction between these two excesses: the former is mainly added to the day consumption when the system is most severely taxed, while the latter principally affects the demand during the night when there is pumping capacity to spare and so is the less significant in its effect upon the operation.

The small cross-hatched areas along the line of daily consumption in Plate III represent the quantity of water supplied by our works for fire extinguishing. The largest quantity is that used on August 2, when occurred the Richards' Mill fire and a fire in the Michigan Central flour sheds, requiring the services of eight and five engines respectively; the total amount used in these two fires being about two million gallons.

The variations in the yearly consumption by seasons are shown in Plate IV, Figs. 1 and 2, page 51. In Fig. 1, ordinates measured from the base of the diagram to the upper irregular line represent the hourly consumption of water during the week of maximum demand, that beginning July 24; the ordinates to the lower irregular line represent the hourly supply during the week of minimum demand in the spring. In Fig. 2 the upper irregular line gives the hourly consumption during the week of maximum usage in the winter, and the lower line that for the minimum week of the year, beginning Dec. 18. From these diagrams it is seen at once that the maximum hourly consumption in the summer is a little more than twice the minimum in the same season, and that in the spring and

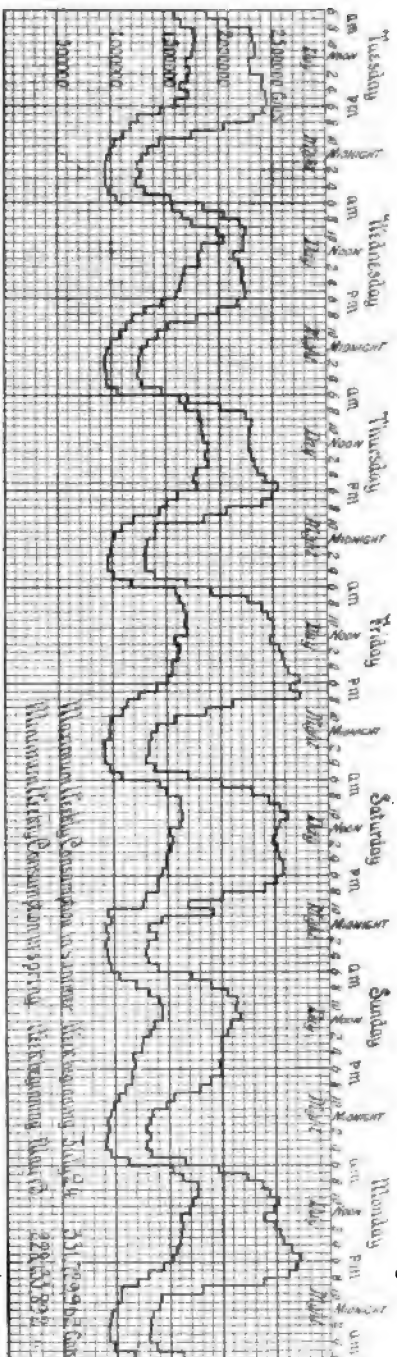
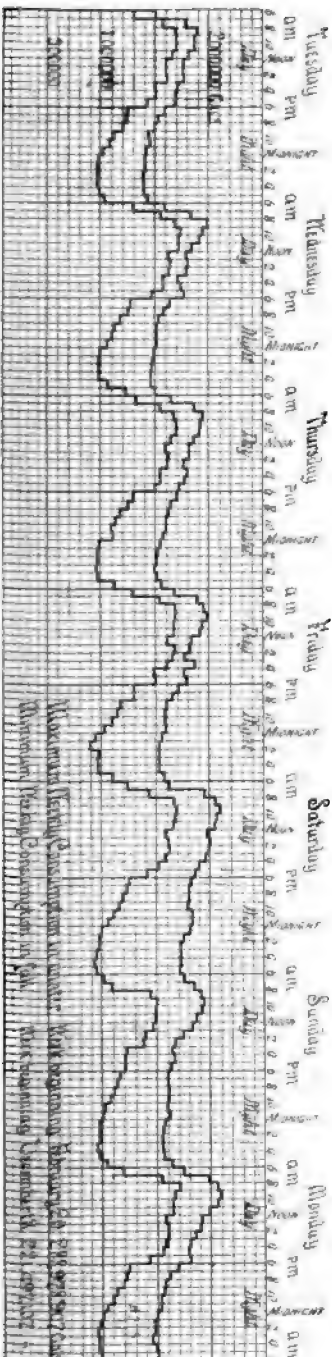


Fig. 2.

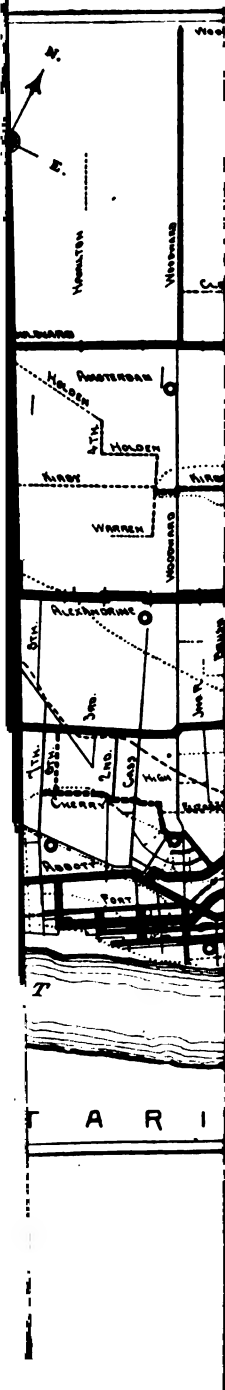


fall the former is slightly less than two times the latter, while during the winter, the minimum may rise to three-fourths the maximum.

From the fact that the hourly consumption between one and four o'clock in the morning averages half as much as the greatest hourly quantity used in the day for three-fourths the year, and in those seasons when there is no especial reason for night usage, it is very evident that there must constantly be a vast quantity of water running to waste from our system either through defective construction, or the carelessness of consumers, or both. Just what this waste really amounts to can only be approximated, but the fact stands, that about 900,000 gallons is the least quantity registered in one hour during the past two years.

The per capita consumption for the year 1894 has fallen below that of last year, and, on the basis of the number of consumers, is less than that of 1892, and is therefore at the lowest point reached since Detroit attained the unenviable distinction of wasting more water per inhabitant than any other large city in the world. The causes of the decrease from last year's consumption are to be found very largely in the milder winter of 1894, and in the introduction, by the Chief Engineer at the Pumping Station, of a device for avoiding the necessity of wasting water at the engines at those times when two engines pump too much, and one engine not enough, for the demand. The consumption for January, February and March, 1893, exceeded that of the same months for 1894 by over four hundred and forty million gallons. The saving at the engines appears to have averaged about a million gallons a day for half of the year. The combined effect of these causes, amounting to a per capita reduction of about six gallons per day, was in part counteracted by the extremely hot and dry weather of July and August, so that the reduction in the daily consumption is, as elsewhere shown, only about four gallons per inhabitant.

The work of the Draughting Room during the year has added greatly to the utility of the records of our system.



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TILDEN FOUNDATION

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TILDEN FOUNDATIONS.

About one-half of the city is now mapped, nearly two thousand drawings having been added during the year, making a total of over three thousand street intersections platted and bound for reference. Besides this, the office has furnished working plans and drawings of "shut offs" for the laying of nearly forty miles of pipe during the season. The force has consisted of the Chief Draughtsman and three assistants, one of whom has been employed nearly the entire time correcting our own and the assessor's maps. The many errors and omissions found in the field notes and foremen's reports of previous construction, has led recently to the transfer to this Department of the keeping of all such records, and a marked improvement is already noticeable. The record of pipeage, as published at the end of this report, has been considerably rearranged since last year. Pipe in east and west alleys is now to be looked for under the heading of the street next north, and pipe in north and south alleys west of Woodward avenue will be found with the street next east, while in those east of Woodward avenue it will be found with the street next west; hence, the alleys adjacent to Woodward avenue will be found with that street. A very few exceptions, and only in cases of diagonal streets, have been made to the above rule. The Boulevard pipeage should now be looked for under the head of the street with which the portion in question is in line; and, finally, all pipeage is read from west to east, or from south to north.

In closing this report, it is pleasing to testify to the cordial and hearty co-operation that has been tendered me by all my associates. Thanks are due to the officer in charge of the local station of the United States Weather Bureau, and to the several City Departments, for many courtesies and valuable information during the past year.

All of which is, gentlemen, very respectfully submitted.

G. S. WILLIAMS,
Civil Engineer.

REPORT OF SUPERINTENDENT OF METERS AND INSPECTION.

DETROIT, January 2, 1895.

To the Board of Water Commissioners:

GENTLEMEN—In compliance with the rules and regulations of your honorable body, I herewith report the work done in the Meter, Inspection, Service Cocks and Repairing Leaks Departments during the year 1894.

The following tables show the number of meters placed, the number removed, and the total number in service December 31st, 1894:

Placed in 1894.

	SIZES.								Total
	5/8 in.	3/4 in.	1 in.	1 1/4 in.	2 in.	3 in.	4 in.	6 in.	
Total number placed during the year.....	287	138	94	49	21	6	5	2	722

Removed in 1894.

	SIZES.								Total
	5/8 in.	3/4 in.	1 in.	1 1/4 in.	2 in.	3 in.	4 in.		
Service connections discontinued....	21	3	3		1				28
Premises vacant.....	24	3	4	1	1				33
For repairs, and replaced with other meters.....	15		4	1	2	1	1		24
Too small for required supply.....		1	4	2	1				8
Too large for required supply.....		1	1	5	2		1		10
	60	13	21	10	8	1	2		115

Meters in Service Jan. 1, 1895.

	SIZES.								Total
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{4}$ in.	2 in.	3 in.	4 in.	6 in.	
In service Jan. 1, 1894.....	1,212	553	535	85	119	58	26	2	2,579
Placed during the year, and in service Jan. 1, 1895.....	387	126	73	29	23	5	3	2	607
Total number in service Jan. 1, 1895.....	1,549	677	598	194	142	63	29	4	3,186

The following tables show the kind and sizes of meters placed during the year, also those removed:

Placed in 1894.

KIND.	SIZES.								Total
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{4}$ in.	2 in.	3 in.	4 in.	6 in.	
Thompson.....	366	136	78	46	28	6	4	2	666
Crown.....	3	1	3	1					8
Hersey.....		1	12	2			1		16
Worthington.....	1		1		2				4
Buffalo.....	1								1
Trident.....	25								25
Union Rotary.....	1				1				2
	397	138	94	49	31	6	5	2	722

Removed in 1894.

KIND.	SIZES.								Total
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	1 in.	$1\frac{1}{4}$ in.	2 in.	3 in.	4 in.		
Thompson.....	38	13	11	8	3		1		74
Crown.....	5		2	1					8
Hersey.....			6		2		1		9
Worthington.....	2		1	1	2	1			7
Union Rotary.....	3				1				4
Neptune.....	4		1						5
Trident.....	8								8
	60	13	21	10	8	1	2		115

The following table shows the total number of meters in service, and the different kinds and sizes, also indicators attached to hydraulic elevators:

In Service Jan. 1, 1895.

KIND.	SIZES.									Total
	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{8}$ in.	2 in.	3 in.	4 in.	6 in.	Indi- cat'rs.	
Thompson.....	1,447	662	485	106	104	44	13	4		2,853
Crown.....	36	16	47	11	13	9	4			130
Hersey.....	2	4	44	3	11	2	8			74
Worthington.....	14	4	17	1	12	6	3			53
Union Rotary.....	9		1	2	2	1	1			16
Neptune.....	21				1					22
Trident.....	17									17
Duplex.....			2							2
Equitable.....			1							1
Ball & Fitts.....			1							1
Buffalo.....		1								1
Indicators.....									9	9
	1,549	676	506	123	143	64	29	4	9	3,193

Meters in Stock.

KIND.	SIZES.								Total
	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	1 in.	$1\frac{1}{8}$ in.	2 in.	3 in.	4 in.		
Thompson.....		8	3	1	4	2	2		20
Crown.....			1	1					2
Hersey			3		2				5
Worthington ..			1						1
Union Rotary	1		6						7
Trident	8								8
Neptune.....	6		1						7
	15	8	13	2	6	2	2		36

Tools and Material on hand.

Valuation of meters in stock January 1, 1895.....	\$390 00
Valuation of material on hand January 1, 1895.....	271 14
Valuation of tools January 1, 1895.....	377 06
Valuation of horses, wagons, bicycles, etc., January 1, 1895.	453 00
	<u>\$2,091 30</u>

Meters in Service.

Valuation of meters in service, Jan. 1, 1894.....	\$77,571 87
Deduct 10 per cent. for depreciation in value.....	7,757 18
	<u>\$69,814 69</u>
Add amount expended during the year for meters placed...	17,913 54
	<u>\$87,728 23</u>
Less stock on hand Jan. 1, 1895.....	2,091 20
Total valuation of meters in service Jan. 1, 1895.....	<u>\$85,637 03</u>
Cost of material used in repairing meters in 1894	\$126 22
Cost of labor in repairing meters in 1894.....	903 25
Total cost of repairs.....	<u>\$1,029 47</u>

Summary of total amount expended in meter department for the years 1889 to 1894, inclusive:

	1889	1890	1891	1892	1893	1894	Total
Meters.....	\$11,175 00	\$18,700 00	\$6,501 55	\$12,371 82	\$6,967 43	\$8,824 08	\$64,559 88
Supt. and labor	1,734 10	8,510 57	4,841 49	8,269 17	8,980 48	6,072 20	39,008 01
Material, tools, etc.....	637 26	2,962 14	872 99	2,132 23	1,650 38	1,833 01	10,108 66
Freight, haul- ing, etc.....	98 05	408 97	197 11	244 08	165 12	201 18	1,314 51
Horse, wagon, etc.....				547 24	184 50	383 07	1,114 81
Total....	\$13,644 41	\$30,601 68	\$12,413 14	\$23,565 24	\$17,967 86	\$17,913 54	\$116,106 87

Six hundred and seven meters have been placed during the past year, and 412 of them at the request of the consumer, showing that the meter is being looked upon at the present time with much favor, rather than with fear and distrust as was the case when they were first introduced, and they certainly will continue to increase in favor as the benefits derived from their use, both to the consumer and the water department, becomes more generally known.

We have now a total of 3,186 meters in service, and are deriving the same satisfactory results as in former years. They are the greatest "leak detectors" known to-day, and it requires no effort on our part to have leaks repaired on metered

connections, as the consumer is only too glad to have an opportunity of reducing his water bill when he knows how to accomplish it.

In metering the public buildings, hospitals, charitable institutions, etc., during the past season, we have found the source of an immense consumption of water, and without doubt a large proportion of it is needless waste. For instance, the consumption at the City Hall is 2,433,500 gallons per month, or nearly 3,000 barrels per day. The Eastern and Western markets consume 1,500,000 gallons per month, an amount that would seem to be far in excess of any reasonable demand. On one of the school buildings the meter showed a consumption of 2,112,000 gallons the first month it was in service, and the same school consumed only 435,500 gallons last month, showing a reduction of 1,676,500 gallons, the effect of paying by meter measurement. There are 54 school buildings metered, and although the reduction has not been in the same proportion in every instance, still it has been large. There are a few still where the consumption seems to be far beyond any reason therefor. The High School, for instance, 1,800,000 gallons, Houghton School, 1,225,000, and Tappan School, 1,500,000 gallons monthly, at least four times as much as there is any possible necessity of using.

The consumption in the different hospitals is enormous in comparison with what they should use legitimately. Take the "Harper," for an illustration, an institution containing, on an average, 150 persons, and their consumption the first month after placing meter, was 2,812,500 gallons, which is a daily per capita consumption of 625 gallons, and at the regular rate would amount to over \$1,100 per annum, being more than the Water Works receive from all the charitable institutions in the city. If the balance of the city—with the free and unrestricted use of water, should use it in the same proportion—estimating the population at 250,000—there would have to be pumped into the mains daily, 156,250,000 gallons for family purposes alone, and to that would have to be added the amount used in stores, factories, livery stables, saloons, breweries,

etc., which would be very nearly as much more (as experience has shown such places have been the most reckless in the waste of water), making upwards of 300,000,000 gallons daily, or about three times the capacity of the present works. Their daily per capita rate in December was 447 gallons, a per capita reduction of 78 gallons. Grace Hospital, with an average number of 135 persons, during 26 days in November, used 1,925,250 gallons, being 548 gallons per day for each person. Their per capita rate in December was 491 gallons, being a reduction of 57 gallons.

The city pays \$1,000 per year for all water used for charitable purposes, an amount that was fixed several years ago, when such institutions were less numerous, and not nearly so pretentious as many of them are at present, and as the most of them are not altogether charitable, I should think the Water Works should receive an amount equal to the cost of furnishing the water, whether the city or the institutions themselves pay for it, but in any event, there should be a limit to their consumption, and the only practicable way that I can see to arrive at it, is to have a stated price for a stated quantity; let the price be the smallest consistent amount, but whatever it is, it will have a tendency to stop the waste, as there will then be an incentive to look after the leakage. Without something of the kind is done, the extravagant consumption will still continue.

The meter has demonstrated that the enormous use of water in many of the public and charitable institutions is largely in excess of their legitimate uses or necessities, and it seems as though on such places as your honorable body furnish water without charge, the quantity should be limited to a reasonable allowance, and all over that to be paid for at the regular rates. It could be arrived at by comparing their consumption during the time the meter was in position and when the occupants were supposed or expected to pay for the amount consumed; said consumption would probably be about what they ought to use legitimately, which is much less than what it has been since they have understood that the water

would be furnished without charge. For instance, why should Mt. Elliott Cemetery consume 204,750 gallons in October and 572,250 in December? If they were obliged to pay for all they used over 200,000 gallons monthly (which is an exorbitant quantity), they would probably confine their consumption to that amount, and by so doing, the Water Works would save 272,000 gallons per month in this one instance alone. Elmwood Cemetery consumed 1,223,250 gallons in November, and very nearly 1,000,000 gallons in December, the necessities of which I am unable to explain.

Police headquarters consumed 262,500 gallons in July and 448,500 gallons in October, and 421,500 gallons in November. The only explanation for the large increase since July is the fact that then they had to pay for the water, and since that time it has been free.

The Elmwood Ave. police station consumed 108,750 gallons in July and 214,500 gallons in December, very nearly double, when from the very nature of things, it should have been much less in December, than it was in July. All of which proves, that to stop waste effectually, there must be a charge for the quantity consumed, which never fails to produce the desired results.

The works are still pumping about 140 gallons daily per capita. On metered premises—that is private families with all modern fixtures such as baths, closets, etc.—the average quantity consumed daily per capita is about 50 gallons, that is on single houses, and in modern flats where from eight to twenty-four families take water through one meter, the consumption is only 40 gallons. Tenement houses where there are no fixtures except the ordinary hydrant, the consumption is 17 gallons, so that for family use the quantity pumped ought not to exceed on an average over 36 gallons daily per capita. Basing our population at 250,000, it shows that 9,000,000 gallons daily would supply the city for family purposes, were the waste reduced to a minimum. Very nearly all of the business places are metered, and as they show a consumption of about 5,000,000 gallons daily, to which may be added 1,000,000 gallons for

small stores, factories, etc., not metered, it appears that about 16,000,000 gallons would be a fair estimate for the daily supply of the city, instead of from 31,000,000 to 52,000,000 gallons, as we have been pumping.

The resolution passed by your honorable body allowing hose connections placed outside of the meter, so that lawn sprinkling should be free, as is the case with unmetered water, is causing some friction. In some cases the lawn is hardly large enough to be called by that name, and at the same time is situated behind the house, or on the side, where by attaching a hose it can be taken into the barn for carriage washing and all uses about the premises, such as flushing closets, washing windows, etc. While the majority will be perfectly honest, and use it for lawn purposes only, there are some who think that public property is legitimate picking, and do not hesitate or allow their conscience to prevent them from keeping their meter bills at the minimum amount each month.

The expense for the care of meters increases in proportion to the number in service. One thing that has caused us much trouble has been the changing of the street mains in different localities from smaller to larger ones. The water being shut off in the main pipes changes the current in the locality in which they are operating, sending it in a different direction, thereby stirring up the sediment in the pipe which is drawn into the service connections, and not only stopping the meter, but often the whole service pipe is filled with it. By the use of the large "Smith-Topping Machine" purchased last season, many of the connections can now be made under pressure, and the above difficulty will be obviated to a large extent. Another cause of trouble has been the hemp packing that has been allowed to get into the pipes while the joints were being calked. It has been the means of shutting off the supply of water on many metered and unmetered service connections, which has caused much annoyance and expense in removing it. Some of our wooden wells that were built five or six years ago are beginning to decay, and where they are outside of the lot line, we are obliged to replace them with brick, as the Board of

Public Works will not allow any more wood put in. It costs a little more to use brick, but in the end it will have been a good investment, as they will require no further attention for many years. At present, nearly all meters are placed at the request of the consumer, and he is obliged to build the well in case one is necessary, so that in the future our only expense for wells will be to replace those we have already built, and at a time when we had to force the placing of the meter.

INSPECTION.

The five leak examiners have made 55,603 examinations during the last year, and reported 4,163 leaks, 3,890 of which were repaired within the time given for same, and 273 were ordered shut off for failure to make the necessary repairs.

The percentage of leaks to number of examinations made was 7.48, being a slight reduction compared with the year 1893, when it was 7.77 per cent.

In many places the water is found running continually, for which different excuses are given; at this season of the year the principal one is to prevent freezing, something that it seems almost impossible to prevent by any other means than a meter, for although fair promises are made to the examiner to prevent him ordering the water shut off, the moment his back is turned the water is running again in the majority of cases.

The increased pressure on the mains has caused many leaks, owing largely to old and worn out service pipes which have been in the ground for many years. Being of a lighter grade than what is being used at the present time, they are giving away under the increased pressure, and it will probably be a source of considerable trouble for some time to come, as there are many of the old connections which will have to be replaced with stronger service pipes in the near future, especially so, if there is any further increase of pressure.

Where leaks are discovered, the occupant is given a stated time to make the necessary repairs, and at the expiration of the time the premises are examined again. If repairs are not made, the water is ordered shut off, unless there is some

good reason for not doing so. In most cases, however, the repairs are promptly made, as will be seen by the small number ordered shut off, the percentage being $6\frac{1}{2}$ of the ~~whole~~ number of leaks reported.

In addition to the foregoing work, the examiners read about 2,700 ~~meters~~ each month, and deliver all of the meter ~~bills~~, with the exception of a few in the outskirts of the city, which are delivered by the service cocks inspectors.

SERVICE CONNECTIONS.

Two thousand and sixty-seven service connections have been made during the past year, consisting of 1,327 $\frac{3}{4}$ -inch, 693 1-inch, 21 2-inch, 12 3-inch, 12 4-inch, 1 6-inch, and 1 10-inch, which added to those previously inserted makes a total of 47,559 service connections in the city on January 1, 1895. In addition to the above we have inserted 939 $\frac{3}{4}$ -inch and 485 1-inch service cocks for the Iron Pipe Department on streets where the old mains have been discontinued and larger ones put in their places. In such cases we have been obliged to connect all of the old service pipes to the new mains, making a total of 1,424 service cocks inserted for the Iron Pipe Department.

All service cocks are now inserted with the Muehler tapping machines which were purchased in 1893, the necessities for which were fully explained in my last annual report. These machines insert the cock with a screw or thread, and with their use the old drive cock has been entirely abandoned. We were under the impression that the "drive cocks" were a source of large waste, as such a large percentage of them were supposed to be leaking, but upon examination of several of the old mains that were exposed during the past season, preparatory to changing them, and while they were under pressure, the writer examined many of the connections and was surprised to find so few of them leaking; and on keeping a record from July 12 to August 30, we find that there were 462 old service cocks taken out, only three of which were leaking, a little over six-tenths of one per cent. However the Muehler cock is

a great improvement over the other, as there is no possibility of them being blown out with an increase of pressure or from any other cause whatever.

There have been one 2-inch, three 4-inch, one 6-inch and one 10-inch service connections made for as many different manufacturing institutions, to furnish water for automatic fire sprinklers, and there being no charge for water used for fire purposes, acting under instructions from the General Superintendent, I have required the parties making such connection to sign an agreement wherein said service is to be kept separate and independent, to be used for fire purposes only, and that no connection shall be taken therefrom for any other purpose whatever, and also to permit a thorough inspection of the system by the Water Board or its employes whenever it so desires. We have nineteen such connections on premises where their regular supply is metered and taken from a separate service, and in making examinations at different times we have only found one instance where the fire service had been tapped to get water that did not pass through the meter; the proprietor however claimed that it was done innocently by their engineer, who was not familiar with the premises, or with the agreement they had signed, and I have no reason to doubt that such was a fact. Nevertheless, as the "automatic fire sprinkler" is getting to be quite popular, it is something that will demand considerable attention in the future.

We still derive the same satisfactory results from the use of the "Smith Tapping Machine" for making large connections under pressure. The largest connection we have made thus far was a 10-inch on the 42-inch main for an automatic fire sprinkler put in by the Detroit Stove Works, and the machine worked to perfection, making the cut in sixty minutes, which was considered good work, it being the first connection larger than a 6-inch that we have made with it. If we had been obliged to make this connection the old way we would have been compelled to shut off the 42-inch main in that locality, which of itself would have been quite a task, besides the inconvenience it would have caused a large number of water

takers; then after cutting the pipe the enormous quantity of water to remove before the joint could be leaded would have been a task, the dimensions of which would have been exceedingly large, all of which was avoided by said machine.

The following statement will show the receipts and disbursements in the Service Cocks Department during the year 1894:

Receipts for service cocks	\$5,281 00	
Receipts from plumbers' licenses.....	608 15	
Receipts from old service cocks.....	117 81	
Received from Park and Boulevard Commissioners..	817 88	
Miscellaneous.....	1 00	
		<hr/>
		\$6,825 84
Total expense Service Cocks Department.....	\$9,497 81	
Less labor of inspectors	8,391 02	
		<hr/>
		6,106 29
		<hr/>
• Balance to credit of service cocks.....		\$219 05
		<hr/>

The following table shows the duties performed by the Inspectors of New Work during the year 1894:

INSPECTION OF NEW WORK.

INSPECTORS.	District.											Totals.
		Examined New Connections.	Examined Extens-ions & Fixtures.	Let on New Connections.	Notified for Building Tax.	Calls for Non-Payment.	Shut for Non-Payment.	Let on Vacants Re-occupied.	Shut for Vacancy and Request.	Examined for Assessors.	Meter Bills Delivered.	
John Hatzembubler.....	1	457	313	166	33	2,183	190	35	168	785	849	5,618
Robert Pelham, Jr.....	2	366	250	298	11	2,005	127	30	116	490	1,178	4,871
C. J. Skinner.....	3	463	433	144	57	2,963	137	26	248	508	947	5,983
*William Forsyth.....	4	8	21	5	1	83	5	33	67	49	133	405
*Frank Clark.....	5	8	24	8	5	119	.....	39	87	43	89	414
Michael Hart.....	6	245	339	343	67	1,843	418	35	104	353	1,306	4,941
John Becker.....	7	230	273	159	96	2,161	320	84	87	287	1,073	4,579
Adolph Janowski.....	8	249	265	233	61	2,353	287	39	107	370	464	4,417
Totals.....		2,014	1,806	1,245	351	13,739	1,394	231	964	2,808	6,081	30,638

* New Inspectors appointed November 30th, 1894.

In addition to the foregoing work, the inspectors have devoted much time to locating and making a record of all stop-boxes throughout the city. They are taking new measurements, as there has been so much changing and subdividing of lots since the beginning of our record, that in many instances we find the location not properly recorded, and when the box happens to be covered up, it takes much valuable time to find it, especially so in case of bursted pipes. As stated in a former report, "It necessitates the utmost vigilance to keep the stop-boxes exposed to view. Sidewalks being repaired, new ones built, or change of grade in street, alley, or lot, the tendency is to pay very little attention to the stop-box, and it is usually covered up, as the majority of property owners can see very little use for it until there is an urgent request to shut off the water on account of bursted pipes, when they have a forcible reminder of its necessity." Not only that, but during the last year there have been 13,729 places reported to be shut off for non-payment, besides 984 to be shut off for vacancy, showing the need of keeping the boxes in sight at all times. A duty that will always exist, will be that of seeing that they are kept in proper condition, and as there about are 50,000 of them at present, one can readily see that it will require much time and watchfulness on the part of the inspectors in giving them the necessary attention.

The increase of work in this Department necessitated the appointment of two more inspectors, said appointments being made by your honorable body in November last. There are now eight inspection districts to correspond with the assessors, so that each assessor has an inspector to attend to that portion of the work that comes directly under his control, something that saves considerable friction, as formerly one inspector received orders from two assessors, and at times the orders were somewhat conflicting, as both assessors occasionally wanted the inspector at the same time, all of which is remedied by the present division.

PLUMBERS AND PLUMBING.

We have had very little trouble with the plumbers of late, as the majority of them follow very cheerfully the rules and regulations governing their work.

The rule adopted by your honorable body requiring all plumbers to pass an examination before the Board of Plumbing Examiners, and produce a certificate from the Board of Health, as to their competency, before a license would be granted them from this office, created some friction, as a number of plumbers who had previously received a license failed to pass a successful examination, and therefore we could not grant them a permit to do plumbing. However, as they were allowed to appear before the examiners several times, the most of them finally succeeded in getting a certificate, and those who did not, the money they paid for their licenses was returned to them, and they were obliged to go out of the business.

Owing to the amount of work done by apprentices, we find that first-class plumbers need fully as much watching as the poorer ones, and that is why I think that a rigid inspection of all plumbing (by thoroughly competent inspectors), both as to material and workmanship, would produce the desired results. The most of the plumbers have succeeded in squeezing through an examination, and getting a certificate, but after all it does not make good plumbers of them. Being obliged to tear out their work, when not properly done, and do it over again, is a splendid educator, and after doing it a few times, they will either do good work, or go out of the business, either of which ought to be satisfactory.

TABLE showing the number of taps made, and the different sizes, in each ward during the year 1894; also those discontinued.

NEW CONNECTIONS.	SIZES.	WARDS.																Total Inserted.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Iron pipe	4-inch	15	9	131	23	205	39	71	38	152	40	135	54	97	66	150	99	1,824
"	1-inch	52	41	37	62	26	53	24	55	15	41	29	34	52	67	83	22	693
"	2-inch	2	8	...	...	...	...	1	1	...	...	1	...	1	...	1	2	17
"	3-inch	2	1	...	...	...	...	...	1	...	...	...	...	...	1	...	...	8
"	4-inch	4	2	1	1	...	2	1	...	1	2	...	...	...	2	1	...	17
"	6-inch	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	2
"	8-inch	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	2
"	10-inch	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
		75	62	169	88	231	94	97	95	169	83	165	88	160	184	240	124	2,064
DISCONTINUED CONNECTIONS.																		Total discon- tinued
	Iron pipe	7	8	2	3	2	4	1	...	...	...	...	...	...	...	4	...	31
	"	5	7	...	...	...	...	1	2	1	7	...	1	...	2	...	...	26
	Wood pipe.....	...	3	129	11	143	...	43	7	104	...	66	...	13	...	...	...	519
	"	8	1	16	11	17	...	7	5	3	...	9	...	7	...	...	...	84
		20	19	147	25	162	4	52	14	108	7	75	1	20	2	4	...	660

TABLE SHOWING NUMBER OF SERVICE CONNECTIONS IN
USE JANUARY 1st, 1895.

SIZE OF CONNECTION.	NO. IN 1893.	ADDED DISCON- IN 1894. TINED	TOTAL JANUARY 1, 1895.	
$\frac{1}{2}$ inch, Cast iron.....	35 028	1,324	31	36,321
1 " "	10,221	693	26	10,884
2 " "	120	17	....	137
3 " "	107	8	....	115
4 " "	73	17	....	90
6 " "	8	2	....	5
8 " " .....	....	2	....	2
10 " " .....	....	1	....	1
*Wood pipe.....	8,105	....	603	2,502
	48,657	2,064	600	50,061
Less error in wood pipe estimate.				2,502
Aggregate.....				47,559

REPAIRING LEAKS.

The General Superintendent placed this department under my control last July; since that time we have had no serious leaks to contend with. During the year there have been eleven breaks reported in the main pipes, two of them were in the 30-inch, one in the 24-inch, two in the 6-inch, five in the 4-inch, and one in the 3-inch, all of which were repaired without difficulty. There were also found 38 leaking joints, seven of which were in the 42-inch, three in the 30-inch, five in the 24-inch, one in the 16-inch, one in the 10-inch, fourteen in the 6-inch, six in the 4-inch, and one in the 3-inch mains. Sixty-seven street

*Many years ago there was an estimate made of the number of service connections attached to the wood mains, as previous to that time there was no record kept of the number of such connections. Since the estimate was made, however, there has been a record kept each year of the number added, and also those removed. During the last year all wood mains have been taken out, and with them 603 service connections, leaving 2,502, which number must have been an error in making the original estimate, and will therefore have to be deducted from the total number, as shown in our last Annual Report, making (after adding those inserted during the year 1894) a total of 47,559 service connections in use on January 1st, 1895.

gates were reported leaking, and were repaired as follows : One 24-inch, one 10-inch, three 8-inch, twenty-nine 6-inch, twenty-eight 4-inch, and five 3-inch. One new 6-inch gate was set to take the place of one that could not be repaired.

Numerous leaks have been reported, which after being located, have been found to be on service connections, when they have either been shut off at the stop-box or at the main, as the necessities required, and then turned over to the owner or occupant for repairs.

All complaints of "bad water" have been given immediate attention. The complaints usually come from localities which get their supply from a pipe with a "dead end," and on which there is a "blow-off gate," the opening of which for a short time usually remedies the trouble, but, only temporarily, for as long as we have "dead ends," just so long will we get complaints of bad water, but as the number is gradually growing less, we hope the time is not far distant when they will all be done away with, as far as it is possible to do so. We have now 521 blow-off gates, (as against 667 the previous year), not all of which are on "dead ends" however, as many of them are permanently set at special points along the line of pipe.

We have had a great deal of trouble in this Department during the past season with "hemp" getting into the service pipes, as previously mentioned under the head of Meters. We have had to dig up fifty-six service connections, sometimes at the main, and at other times under the buildings, as it was liable to wedge itself into the pipe at any point between the main and faucet in the building. The foregoing trouble has occurred usually in the immediate vicinity of where the Iron Pipe Department were laying pipe, and was caused by some of the men allowing the packing to get into the pipe while they were calking the joints. As it only occurred on some special lines the fault was discovered, and since that time we have had very little trouble from that cause.

Owing largely to the efficiency and experience of our foreman, Mr. Wallace, the work in this Department has been done in the most satisfactory manner.

Attached to this report are complete lists of tools on hand, and an itemized account of material in stock in the Meter, Service Cocks and Repairing Leaks Departments on the 31st day of December, 1894.

In conclusion will say, that I think the men in the different departments over which I have charge, are entitled to much credit for the faithfulness with which they have done their work, all of them having shown a desire to give their best services to the works, to which they (the works) are entitled.

Thanking your honorable body for the very courteous and considerate manner extended me upon all occasions, the foregoing report is respectfully submitted.

T. R. PUTNAM,

Sup't Meters and Inspection.

REPORT OF CHIEF ENGINEER AT PUMPING WORKS.

DETROIT, January 1, 1895.

To the Board of Water Commissioners :

GENTLEMEN—I have the honor to submit the Engineer's report for the year 1894.

The following table shows the number of gallons of water pumped, and cost of fuel for the years named:

YEAR.	GALLONS OF WATER PUMPED.	COST OF FUEL CONSUMED.	AVERAGE DAILY DELIVERED.
1892.....	235,840,271	.....	646,411
1893.....	303,531,743	\$2,129 37	831,594
1894.....	370,265,126	2,271 34	1,030,806
1895.....	542,807,364	3,335 81	1,487,143
1896.....	692,124,305	4,017 44	1,898,231
1897.....	697,190,524	3,993 20	1,909,887
1898.....	718,091,207	3,655 20	1,967,373
1899.....	762,112,567	3,194 15	2,142,774
1900.....	870,036,451	4,196 21	2,393,590
1901.....	895,129,423	4,414 07	2,452,409
1902.....	994,945,829	3,150 95	2,726,878
1903.....	1,036,798,043	4,670 86	2,837,808
1904.....	1,018,990,256	7,647 62	2,839,078
1905.....	1,049,514,887	7,372 89	2,875,588
1906.....	1,196,317,922	9,349 16	3,277,582
1907.....	1,425,595,280	10,121 82	3,908,576
1908.....	1,686,546,125	11,579 23	4,597,248
1909.....	1,946,810,325	11,247 92	4,517,809
1910.....	1,866,060,088	12,718 78	5,112,493
1911.....	2,300,150,605	14,681 05	6,301,782
1912.....	2,783,292,578	17,736 86	7,601,922
1913.....	3,198,398,948	20,233 80	8,792,723
1914.....	3,289,872,635	20,431 71	9,013,850
1915.....	4,207,454,260	21,393 98	11,527,272
1916.....	4,065,134,470	19,632 89	11,107,499
1917.....	4,213,239,790	17,433 72	11,543,123
1918.....	4,345,743,330	10,943 52	11,906,146
1919.....	5,129,596,110	11,219 51	14,053,596
1920.....	5,552,965,310	12,276 60	15,172,032
1921.....	6,543,127,968	16,556 63	17,926,377
1922.....	6,384,000,742	13,156 16	17,261,440
1923.....	7,379,327,188	16,495 39	20,217,534
1924.....	8,610,614,140	19,877 07	23,253,044
1925.....	9,870,829,580	21,341 48	27,317,341
1926.....	10,576,571,254	20,887 24	28,976,007
1927.....	13,168,259,808	35,882 83	36,079,166
1928.....	14,380,166,670	39,568 66	39,397,716
1929.....	12,875,434,453	34,413 81	35,274,888
1930.....	12,120,944,532	31,852 40	33,209,467
1931.....	12,057,391,230	33,826 66	33,033,592
1932.....	12,476,612,482	31,031 40	34,182,499
1933.....	13,877,977,208	27,479 93	38,021,855
1934.....	13,649,779,605	29,283 47	37,390,656

The following tables show in detail the work done by each engine each month of the year.

ENGINE No. 1.

MONTHS.	Time run.		Revolutions.	Gallons Water.	Gallons of Oil.	Cost of Oil.	Duty.
	H.	M.					
January.....	573	...	276,174	427,517.252	56,873	\$493 10	71,459.122
February.....	672	...	339,694	532,949.912	71,496	1,150 11	70,000.125
March.....	230	...	170,708	964,386.494	84,980	561 56	72,699.875
April.....	91	25	47,972	71,389.656	9,900	159 39	71,940.865
May.....	361	30	184,576	270,702.442	32,596	534 90	73,681.396
June.....	167	05	139,601	189,443.178	24,690	327 51	74,399.965
July.....	512	25	289,606	394,467.028	52,366	837 46	74,799.807
August.....	177	10	100,987	159,259.476	22,212	344 29	70,802.369
September.....	360	10	196,303	282,969.656	35,469	549 77	70,199.367
October.....	684	10	321,808	412,371.944	58,350	904 42	69,127.540
November.....	511	40	299,763	361,191.412	53,978	836 62	64,739.464
December.....	734	10	365,704	458,779.906	62,573	999 89	67,474.453
Total.....	5,014	45	2,730,847	3,781,844,046	515,811	\$8,118 90	...

ENGINE No. 2.

January.....	680	55	306,236	419,861.764	55,867	\$477 15	71,400.426
February.....	672	...	343,626	552,360.908	75,060	1,309 46	70,611.694
March.....	540	40	289,438	347,379.652	45,852	734 21	72,662.231
April.....	436	...	249,059	304,243.386	36,697	439 62	71,934.594
May.....	352	45	183,338	228,342.072	37,494	442 65	73,654.790
June.....	365	55	227,479	290,462.134	39,169	630 62	74,232.565
July.....	493	50	275,454	310,903.332	42,365	669 56	74,002.654
August.....	744	...	404,944	489,745.094	69,772	1,065 96	70,306.672
September.....	369	...	204,962	261,461.928	36,666	564 32	70,144.754
October.....	340	...	134,146	210,532.352	29,717	480 61	69,189.969
November.....	315	...	172,486	270,709.664	41,344	640 89	61,741.120
December.....	72	...	39,060	62,792.100	8,580	132 64	67,904.280
Total.....	5,941	06	2,830,839	3,655,010,194	497,567	\$7,664 98	...

ENGINE No. 3.

January.....	284	...	149,306	208,500.000	35,738	\$361 06	71,400.001
February.....	264	...	146,530	262,370.000	34,764	559 70	71,602.710
March.....	730	...	407,546	731,962.000	97,800	1,574 57	71,940.872
April.....	96	...	52,166	99,929.000	11,304	161 99	70,000.443
May.....	600	...	245,461	621,229.000	82,437	1,327 23	74,232.565
June.....	431	30	255,570	464,390.000	61,696	973 09	74,002.654
July.....	721	40	435,891	784,613.000	111,542	1,726 90	70,306.672
August.....	552	...	310,145	554,392.000	78,275	1,213 26	70,144.754
September.....	432	...	225,096	421,692.000	59,945	989 15	69,127.540
October.....	312	...	167,605	301,792.000	45,086	698 63	64,739.464
December.....							
Total.....	4,417	...	2,506,835	4,510,508,000	618,577	\$8,749 74	...

ENGINE No. 4.

MONTHS.	Time run.		Revolutions.	Gallons Water	Gallons of Oil.	Cost of Oil.	Duty.
	H.	M.					
January.....							
February.....							
March.....	312		243,432	191,094,120	25,232	\$406 10	
April.....							
May.....	648		590,029	455,322,765	54,826	882 73	
June.....	118	30	108,756	85,373,460	11,318	182 22	
July.....	361	45	275,377	216,170,945	28,988	458 16	
August.....							
September.....	168		162,362	127,454,170	17,870	276 98	
October.....	72		71,920	56,457,200	7,967	123 49	
November.....	91	45	89,040	69,111,400	10,328	160 08	
December.....	661	50	638,775	501,438,375	68,394	1,090 10	
Total.....	2,333	40	2,168,691	1,702,422,435	294,916	\$3,549 86	
Aggregate.....	17,006	30	10,235,702	13,649,779,605	1,866,361	\$29,283 47	

Fuel oil consumed.....	\$29,283 47
Salaries, engineers and firemen.....	15,874 34
Consulting engineer.....	1,110 00
Coal for pumping oil.....	87 90
Printing and stationery.....	9 14
Material—rags, waste, polish, etc.....	315 98
Material—valves, gaskets, etc.....	346 49
Repairs, boilers and machinery.....	218 58
Lubricants.....	368 03
Horse farrier.....	3 50
Harness and repairs.....	6 65
Horse feed, shoeing, etc.....	33 83
Street car tickets.....	11 50
Expenses on electric light.....	50 99
Insurance.....	400 00
Car rental.....	4 00
Ice.....	21 76
	<u>\$48,146 11</u>

Cost per million gallons, \$3.52. Nos. 1 and 2 Engines were run a good part of the year with pumps single acting.

The tables show that the water pumped during the year is 13,649,779,605 gallons. The total expense for pumping water is \$29,283.47, making the cost per million gallons, \$3.52. It will be noticed that the duty has fallen some, but this is accounted for by the additions to the heating and lighting

The following tables show in detail the work done by each engine each month of the year.

ENGINE No. 1.

MONTHS.	Time run.		Revolutions.	Gallons Water.	Gallons of Oil.	Cost of Oil.	Duty.
	H.	M.					
January.....	573	...	276,174	42,517,352	56,873	\$493 10	71,449,132
February.....	672	...	339,694	52,440,312	71,436	1,150 11	70,000,142
March.....	230	...	170,708	26,125,284	24,180	561 56	72,000,112
April.....	91	25	47,972	7,120,656	9,900	159 39	71,000,002
May.....	361	30	184,576	27,702,542	22,596	524 10	70,000,006
June.....	167	05	139,601	18,448,378	24,690	297 51	74,000,045
July.....	512	25	289,605	39,448,028	52,356	427 46	74,000,007
August.....	177	10	100,987	15,320,476	22,212	344 24	70,000,000
September.....	360	10	195,305	25,000,556	25,409	549 77	70,000,007
October.....	684	10	321,808	41,871,044	64,330	904 42	69,197,140
November.....	511	40	299,763	36,141,412	53,976	435 62	64,700,100
December.....	724	10	365,704	45,779,006	62,573	969 84	67,475,420
Total.....	5,014	45	2,730,847	3,781,844,046	515,311	\$8,118 90	...

ENGINE No. 2.

January.....	620	55	306,336	419,861,764	55,857	\$477 15	71,460,420
February.....	672	...	343,626	552,330,008	75,080	1,208 46	70,000,000
March.....	540	40	299,438	347,376,352	45,452	729 21	72,000,000
April.....	425	...	349,059	200,248,486	96,697	429 62	71,000,000
May.....	352	45	183,328	226,342,072	27,494	442 65	73,000,000
June.....	395	55	227,479	256,437,494	39,169	630 62	74,000,000
July.....	403	50	275,454	311,800,232	42,365	666 56	74,000,000
August.....	744	...	404,944	483,740,008	64,772	1,065 96	70,000,000
September.....	369	...	204,982	261,491,024	36,686	564 32	70,000,000
October.....	940	...	134,146	210,402,052	29,717	480 61	66,120,000
November.....	315	...	172,486	276,700,064	41,544	640 43	61,111,000
December.....	72	...	29,050	62,792,400	8,560	132 64	67,000,000
Total.....	5,941	05	2,830,839	3,655,010,194	497,557	\$7,864 98	...

ENGINE No. 3.

January.....	284	...	149,205	268,560,000	35,726	\$561 06	71,460,001
February.....	264	...	146,330	264,270,000	34,764	529 70	72,000,000
March.....	730	...	407,546	72,402,400	97,410	1,274 57	71,000,000
April.....	96	...	52,166	94,000,000	11,304	181 90	70,000,000
May.....	600	...	315,461	62,400,000	82,437	1,027 23	74,000,000
June.....	481	30	255,570	46,000,000	61,696	975 09	74,000,000
July.....	721	40	435,491	78,000,000	111,542	1,248 30	70,000,000
August.....	552	...	310,145	55,000,000	78,275	1,122 26	70,000,000
September.....	432	...	235,026	42,000,000	59,945	929 15	66,100,000
October.....	312	...	167,605	30,000,000	45,046	628 43	64,700,000
December.....	...	...	...	...	...	...	...
Total.....	4,417	...	2,506,835	4,510,500,000	618,577	\$9,749 74	...

ENGINE No. 4.

MONTHS.	Time run.		Revolutions.	Gallons Water	Gallons of Oil.	Cost of Oil.	Duty.
	H.	M.					
January.....							
February.....							
March.....	312		243,432	191,094,120	25,223	\$406 10	
April.....							
May.....	648		590,029	455,322,765	54,328	882 73	
June.....	118	20	108,756	85,373,460	11,318	182 22	
July.....	261	45	275,377	216,170,945	28,988	458 16	
August.....							
September.....	168		162,362	127,454,170	17,870	275 98	
October.....	72		71,920	56,457,200	7,967	123 49	
November.....	91	45	88,040	69,111,400	10,338	160 08	
December.....	661	50	638,775	501,438,375	68,994	1,090 10	
Total.....	2,333	40	2,168,691	1,702,422,435	224,916	\$3,549 86	
Aggregate...	17,006	30	10,235,702	13,649,779,605	1,866,361	\$29,283 47	

Fuel oil consumed.....	\$29,283 47
Salaries, engineers and firemen.....	15,874 34
Consulting engineer.....	1,110 00
Coal for pumping oil.....	87 90
Printing and stationery.....	9 14
Material—rags, waste, polish, etc.....	315 98
Material—valves, gaskets, etc.....	346 49
Repairs, boilers and machinery	218 58
Lubricants	368 08
Horse farrier	8 50
Harness and repairs.....	6 65
Horse feed, shoeing, etc.....	33 83
Street car tickets.....	11 50
Expenses on electric light	50 99
Insurance.....	400 00
Car rental.....	4 00
Ice.....	21 76
	<u>\$48,146 11</u>

Cost per million gallons, \$3.52. Nos. 1 and 2 Engines were run a good part of the year with pumps single acting.

The tables show that the water pumped during the year is 13,649,779,605 gallons. The total expense for pumping water is \$29,283.47, making the cost per million gallons, \$3.52. It will be noticed that the duty has fallen some, but this is accounted for by the additions to the heating and lighting

plants, the steam for which is taken from the old boilers and hence affects the figured duty for engines Nos. 1, 2 and 3, and because during the past year we have only credited the engines with the work actually performed.

Our pressure has been carried higher at this station this last year than previously, and every foot in height adds to the cost.

In connection with our lighting plant, I will say that it is being over-loaded. If the city lights could be used to light the grounds, we would be able to save additional expense in the lighting department. Our dynamos are one hundred light machines, and are now loaded to one hundred and twenty lights.

Crude oil as fuel is clean and convenient, but like other fuels it varies in quality, and I am satisfied has not the heating qualities as formerly; also, it is not convenient to measure. It is supposed to be sold at 60 degrees Fahr., and for every change of 25 degrees 1 per cent. added or deducted, as the case may require. It will readily be seen that if metered, we would be troubled with the same difficulty, but with gases collecting in the meter added.

The arrangements which I recommended in my last report, so as to convert our pumps from double to single acting without stopping, was completed and tested May 13th, and proved to be a great improvement, which has been needed ever since the reservoir has been discontinued. We not only save water by its use, but it does not leave the engines disabled as formerly, saying nothing of the convenience; but to complete its efficiency, I have recommended changing the Stevens cut-off for that of the Sickles, which I expect will be finished about the 10th of February. We would then be able to cut off at the point desired when working our pumps single acting, and would then get the benefit of the expansion of the steam, which means the saving in fuel.

Engines Nos. 1, 2 and 3 are in fair condition, although but minor repairs have been done to them this last year.

Since removing weight from fly-wheel of No. 1 engine,

and balancing by placing weight in piston instead, the engine runs much smoother.

The boilers are in fair condition, considering their age; but minor repairs have been made to them the past year. The boilers in the west room have been in service eighteen years. I would like to have them replaced with some of the latest improved. That would give us a higher pressure of steam, which I consider would be an improvement, for the pressure that has been carried has always been too low for a compound engine.

Previous to this fall and winter, we have been troubled with weeds and ice on our river strainers. I conferred with Mr. Kirby, and suggested taking every other slat out of face of strainer, which was done last summer, and I am satisfied it will be a great benefit. Instead of being blocked out in the river as formerly, we may be blocked at our inland strainers; if so, we can readily clear them.

In my last report it was recommended to discontinue the stand pipe, by placing additional relief gates on the pipes. I think it would be perfectly safe to shut it off, with what relief we now have on our engines, but, certainly, the higher the pressure added each year, the greater will be the strain on our pumps and connections. I consider, however, the stand pipe is not effective for the purpose of taking the pulsation off the pumps, or a guard against a water ram. Heavy bodies move slowly. That being the case, it is certainly no use for either purpose. The cause of the water ram or hammer which has been mentioned in former reports is not quite clear to me, for not having any valves or gates of sufficient size that could be closed quickly, I can see but one way to account for it, which is by air collecting in the pipes at some high part of the system.

The continuous running of our new triple expansion engine has been considerably interfered with by defects in the suction conduit, but the necessary alterations have now been made and no further trouble is anticipated. The engine has been run intermittantly for some time, but not at its full capacity long enough to show conclusively what duty it will perform. In

consequence, I have left duty space in table blank, but feel satisfied that it will come up to expectations. The official test we expect will be made some time in the beginning of the new year.

The new tile roof which was put on the engine house last fall is a decided improvement on slate, as it readily absorbs the condensation, which the slate would not do. The building is also warmer.

Respectfully submitted.

URIAH GOULD,
Engineer.

REPORT OF THE SUPERINTENDENT OF GROUNDS.

To the Honorable Board of Water Commissioners :

GENTLEMEN—In submitting my report for the year, I beg leave to say your predecessors certainly made no mistake in acquiring this splendid site for the City Water Works. The improvements under your direction and the gentlemen who have preceded you, must be a source of gratification to you and the citizens of Detroit.

Facts and figures show it to be a pumping station that for efficiency and beauty is equalled by few and excelled by none.

The surrounding Park is rapidly coming into a high state of cultivation, and the multitudes who visit it testify that as a place of rest and recreation, it is one of which the citizens of Detroit may justly feel proud.

Of the improvements completed this season, the Hurlbut Memorial Gateway notably is a thing of beauty and grandeur that will perpetuate the name of Chauncey Hurlbut for hundreds of years.

The winding canal dredged from the river through what was previously a low marsh, has greatly improved this part of the grounds. The leveling and planting of trees and shrubs make this a valuable addition to the Park. It will, however, be two or three years before the ground will be firmly settled and covered with good sod. Of the two islands the larger has been planted with trees and shrubs, while the smaller one will be kept for flowers.

Another of this year's improvements is our water pipe system for sprinkling purposes, which is now complete.

There are a few needed improvements which I hope you will order the coming year, *i. e.*, a ladies' toilet room and a

shelter for horses. I have mentioned these in former reports, but as they are so much needed, I take the liberty of calling your attention to them again. Within a year or so we should have some good substantial bridges across the winding canal—one team and two foot bridges. The temporary bridges will answer for the present.

I understand the Superintendent and Secretary has already recommended the removal of the old dock and the fence around the basin. The dock is fast going to decay and is an eyesore. I hope you will order it removed soon, as we have no use for it other than an earth embankment between the basin and the canal. The fence was erected probably to keep animals from the water, but as no animals are allowed to run at large in the Park now, it has become useless, and that part of the Park will be very much improved by having it removed.

The lighting of the grounds is hardly satisfactory, as the recent addition to the engine house and the new engine require all the light the dynamos are able to furnish. I would be pleased to have the outside lighting done by the public lighting plant.

Our greenhouse stock is in splendid condition. Although we are in need of more room, we hope by skillful management to make a floral display equal to any in the country next season.

With this I enclose invoice of movable property in this Department.

Respectfully submitted.

E. A. SCRIBNER,

Superintendent of Grounds.

REPORT OF THE SUPERINTENDENT OF EXTENSIONS.

DETROIT, MICH., January 2d, 1895.

To the General Superintendent and Secretary:

DEAR SIR—In accordance with the regulations of the Board of Water Commissioners, I have the honor of presenting to you my Annual Report, relative to the general condition and progress of the work in this Department.

The records of the year just closed reveal the fact that not less than 39 miles of extensions have been added to our pipeage.

The work of the year has been one of ceaseless activity, there having been but little cessation in the work of extensions during each month of the year, the average having been about 3.25 miles per month.

It may be seen by the records of this office that the greater number of lines laid have been for the replacing of wood and smaller lines of iron pipe, and otherwise improving the pipeage system. There is now but 950 feet of the log pipe left in use, and this is only temporarily left in. The coming season will no doubt see the closing up of this system. Seven hundred and twenty-five feet of this log pipe will be found in the abandoned section of Holden avenue, between Second and Third avenues; the other 225 feet is also in a vacated alley north of Grand River avenue, from west line of Lincoln avenue to alley west, left in to cure a dead end.

While it may be in order to congratulate ourselves that the old log-pipe system is now so near its extinction, we can not but remember how great a part it has played in the extension of the borders of this our beautiful city, though meager in its supply.

The laying of the pipe for the past year has been very generally distributed through the city, with the view of strengthening some of the weak points. I am pleased to know that many of these lines, as appearing in the records of our work of the past year, are among the recommendations of 1891, 1892 and 1893. Not a few of the larger lines were laid in the more central portions of the city, as well as in adjacent sections. Two rather lengthy lines were laid, extending beyond the city limits. One of 6- and 8-inch pipe was laid along Jefferson avenue to the new Driving Park, and the other, a 6-inch pipe, in line of Mt Elliott avenue, to the Forest Lawn Cemetery.

The principal lines appear in the following list of lines laid, as per size of pipe and locations: A line of 16-inch was laid in the upper section of the city, through Farnsworth street and Kirby avenue. This line takes its supply from the upper 42-inch main in Canfield avenue, running northerly in Dubois street to Farnsworth street, and thence westerly in Farnsworth street to Rivard street, and from this point northerly to Kirby avenue, and in Kirby avenue from Rivard street to Cass avenue, all intersecting lines of pipe connecting thereto. From the westerly end of this main, a line of 10- and 12-inch pipe was laid in Cass avenue, the 12-inch being a short section, running from Kirby avenue south on the east, to Kirby avenue north on the west, distance about 150 feet. On Cass avenue, a line of 10-inch pipe was laid from Kirby avenue south to Warren avenue, and from Kirby avenue north to Holden avenue. From this line on Cass avenue, two lines of 10-inch and one of 8-inch were laid in a westerly direction, the one in Holden and Bratshaw avenues running from Cass to Fourth avenues, thence from this point in Fourth avenue to Holden avenue, and from this point at Fourth avenue a line of 8-inch pipe was laid to the North Boulevard. The second line of 10-inch pipe was laid in Kirby avenue, from Cass to Trumbull avenues, and from which an 8-inch pipe was laid in Kirby avenue to Twelfth street. The 8-inch line was laid in Warren avenue, from Cass to Third avenues. Two lines of 12-inch main were laid in the central portion of the city, one of which was in Monroe ave-

nue, from the 24-inch main in Cadillac Square, connecting with the same, and running north to Randolph street. The other line of 12-inch main takes a zig-zag course, connecting with the 30-inch main in Mullett street at Hastings street, thence running north in Hastings street to Catherine street, and westerly in Catherine street to the intersection of Gratiot avenue and St. Antoine street, connecting with the 6- and 10-inch pipe in Gratiot avenue. From this point the line takes a northerly direction in St. Antoine street to Elizabeth street, and in this street westerly to Beaubien street. From this point it again runs northerly in Beaubien street to Adelaide street, and in Adelaide street from Beaubien street to Brush street. From this point the line was reduced to 10-inches, the line running northerly from this point to Edmund Place connecting with the 24-inch main at this point. In addition to the above, 10-inch pipe was laid in Baldwin avenue, from Waterloo street to Gratiot avenue; Hamilton Boulevard, from Blaine avenue to Hazelwood avenue; Oakland avenue, from Belmont avenue to Harmon avenue, and from the North Boulevard to Horton avenue; also from Hamlin avenue to Marston Court.

The 8-inch pipe covers a distance of over 7 miles. Some of the lines were in consecutive order as follows: Beaubien street, running north from the 30-inch main in Gratiot avenue to Madison avenue, and from this point westward in Madison avenue to Brush street; thence north in Brush street to Elizabeth street, and westward in Elizabeth street to Park street. Benton street, from Beaubien street to Brush street; thence north in Brush street to Rowena street; westward in Rowena street to John R Street, and northward in John R street to Brady street. A line of 8-inch was laid in Adelaide street, from Brush street to Woodward avenue, and in High street, from Brush street to Woodward avenue. A line of 8-inch was also laid in consecutive order as follows: Brady street, from the 10-inch main in Beaubien street to Brush street; thence north in Brush street to Alexandrine avenue, and from which a line of 6-inch pipe was laid in Alexandrine avenue to John R street. Eight-inch pipe was also laid in Columbia street from

Beaubien street to John R street, and in Bagley avenue from Park street to Grand River avenue; also in Rowland and Griswold streets, from Michigan avenue to Clifford street. This line connects with the 24-inch main in Michigan avenue, and the 30-inch in State street. A line of 8-inch was laid in Martin Pl., from John R street to Woodward avenue. Two sections of 8-inch pipe were laid in Twelfth street; the lower section was from River street to Lafayette avenue, the upper section from Howard street to Baker street, and from which a line of 6-inch was laid in Howard street, from Tenth street to Twelfth street. The 8-inch line will connect with the new 12-inch main to be laid in Porter street. An 8-inch line was laid in alley east of Woodward avenue, from end of pipe north of Gratiot avenue to John R street; also in Woodbridge street, from Woodward avenue to St. Antoine street; and from this point in said street a 6-inch pipe was laid to Orleans street. The following 8-inch lines were laid in the more easterly and westerly portions of the city: West side: in Clark avenue from Fort street to end of pipe south of Dix avenue. This is now a continuous line of 8-inch from River street to M. C. R. R., connecting with the 10-inch main in Dix avenue and the 8-inch in Fort street; Thirty-fourth street from Jackson street to Michigan avenue; Vinewood avenue, from Merrick avenue to Grand River avenue. East side: Trombly avenue, from Dubois street to St. Aubin avenue; Dubois street, from Piquette avenue to Trombly avenue; Hastings and Theodore streets to Warren avenue; Oakland avenue, from Englewood avenue to Harmon avenue; Indiana street, from Beaubien street to Russell street; Leland street, from Dequindre street to Russell street, and in Van Dyke avenue south of Worcester street. There has been over 25 miles of 6-inch pipe laid, covering over 300 locations and ranging in lengths from 5 to over 8,000 feet.

In addition to the lines above mentioned, ten connections have been made of 8- and 10-inch diameters, with the upper 42-inch main in Mack avenue. The following are the points of connections: Ellery, Meldrum, Beaufait, Canton, Sheridan, Townsend, Helen, Fisher, Belvidere, Rohms, Holcomb and

Maxwell avenues. When this line of 42-inch main was laid, only 50 per cent. of the above-mentioned avenues were platted, and these but a short distance north of Jefferson; the balance were not platted until a number of years later, otherwise, branches would have been set at the street intersections. Such as were properly open at the time were provided with branches.

PIPEAGE.

The amount of distribution pipe and mains laid and re-laid, and iron and wood pipe discontinued during the past year, is as follows: Total iron pipe laid and re-laid 39 $\frac{1}{2}$ miles, of which 814 feet were re-laid; 3 $\frac{1}{2}$ miles of wood and 8 $\frac{1}{2}$ miles of iron pipe were discontinued, making the net increase of the pipeage, 27 $\frac{1}{2}$ miles. This amount added to the measured lines of iron and wood pipe connected with the works will make the total length 483 $\frac{1}{2}$ miles, of which 483 $\frac{1}{2}$ miles are iron, and 951 feet are wood pipe, which in detail is as follows:

SIZE OF PIPE IN INCHES.	MEASURED LENGTH IN FEET FOR 1893.	ADDED LENGTH IN FEET FOR 1894.	DISCONTINUED LENGTH IN FEET FOR 1894.	TOTAL LENGTH IN FEET FOR 1894.
45	108	.....	.....	108
42	45,127	80	.....	45,207
36	715	.....	.....	715
30	49,337	.....	.....	49,337
24	84,818	.....	.....	84,818
20	461	.....	.....	461
18	87	.....	.....	87
16	36,777	8,460	.....	45,237
12	8,444	8,675	.....	12,119
10	114,509	14,075	.....	128,584
8	219,795	38,641	.....	258,436
6	917,408	135,019	3,974	1,048,453
4	831,348	5,810	36,058	801,100
3	76,302	2,166	5,211	73,257
2	2,820	.....	.....	2,820
Total,	2,388,046	207,926	45,243	2,550,729

When I was appointed Superintendent of Extensions and Repairs in the early season of 1877, I found the total pipeage of the city did not exceed $187\frac{1}{2}$ miles, of which $94\frac{1}{2}$ miles was of iron, and $92\frac{1}{2}$ wood pipe. During the interval which has elapsed between the opening of the season of 1877 and the closing of 1894, the log pipe system has disappeared, less the 950 feet previously mentioned, while that of the iron pipe has increased over 500 per cent., making the total increase of the pipeage 258 per cent.

There were connected with the water mains 140 hydrants and 26 reservoirs, making the total number now in use 2,478 hydrants and 520 reservoirs.

TABLE OF PIPEAGE AS ARRANGED BY WARDS.

WARD.	4-In.	6-In.	8-In.	10-In.	12-In.	16-In.	18-In.	24-In.	30-In.	36-In.	42-In.	48-In.	2-In.	3-In.	Loss.	Totals.	Feet Discon- tinued.	Feet Added.
First	63,806	58,519	23,893	20,474	2,600	15,573			6,754	3,894	2,349			5,302		211,116	12,634	24,904
Second.....	49,177	43,351	9,324	19,771	564	8,196			5,913	4,194				2,904		142,666	4,844	10,533
Third	39,000	39,397	8,938	8,695	1,933	3,264			4,548	2,399	1,679			5,872		115,675	7,130	14,087
Fourth.....	62,960	56,079	6,645	4,323		3,556			5,323	3,253				6,297	726	149,356	4,744	13,660
Fifth.....	56,777	26,392	10,074	9,720	986	2,491			3,678	2,513	1,749			4,205		118,564	8,521	10,389
Sixth.....	49,035	37,597	13,496	5,944	1,650	1,565			5,433	2,533				5,232	226	122,722	4,164	7,967
Seventh.....	44,706	24,744	19,386	3,576	2,514	802		406	11,255	3,083	1,829			2,598		114,804	4,233	6,013
Eighth.....	48,439	56,807	21,600	161	42			8,277	2,153					7,066	175	145,620	3,612	12,166
Ninth.....	58,506	68,900	12,592	4,103	1,815	3,430		2,433	12,063	715	3,369			6,907		174,883	7,730	10,583
Tenth.....	81,658	81,416	18,612	6,971				10,967	2,443					4,246		206,313		1,846
Eleventh.....	56,967	56,477	5,149	3,696				1,463			3,479			6,597	16	133,494	5,515	6,115
Twelfth.....	38,920	72,413	17,876	3,951	16	140	87	55	7,003	2,598				3,204		136,258	259	6,069
Thirteenth.....	62,325	54,130	8,032	3,016				513	7,173		7,519			7,073		149,751	805	11,708
Fourteenth.....	33,223	35,498	22,662	5,241		2,636		11,208	1,018					3,119	160	174,695	214	15,492
Fifteenth.....	39,478	147,969	32,590	9,298							29,324	108	2,820	712	218	297,377		22,968
Sixteenth.....	23,916	104,295	18,548	10,772		3,533								1,718		163,022		15,539
Outside city limits, 3,485		24,648	7,734											80		35,947		18,137
Totals in Feet.	801,100	1,043,453	253,426	128,564	12,119	45,267	87	461	84,813	49,337	45,307	715	103	2,820	950	564,2,553,243	64,414	207,996

I am glad it has appeared wise to you to place the care of our water-gates, and the appurtenances thereto, in competent hands. The unskillful handling of this branch of the pipe system during the early part of last year, and the latter part of the previous year, has been the cause of endless annoyances. I am now looking forward, with special interest, to the abatement of the former annoyances. Mr. John Bridge, whom you have appointed Superintendent of this Department, with his practical mechanical abilities, should be sufficient guarantee that this branch of the works is in efficient hands.

Owing to the cause of some unforeseen changes in the office of this Department during the past year, it has in some measure complicated our work, which for a time has been a source of additional care. I trust, however, that the opening season, with our increased force of clerical help, under the efficient supervision of Mr. A. W. Goodsell, will be the means of a complete and satisfactory showing of this Department work.

TABLE OF NEW GATES SET FOR SHUT-OFFS.

No. of each kind.	NAME OF GATE.	SIZE.	REMARKS.
10	Murdock Valve Company.....	16-in.	Set for Shut-off.
7	" " "	12-in.	" "
34	" " "	10-in.	" "
73	" " "	8-in.	" "
340	" " "	6-in.	" "
1	" " "	6-in.	For Blow-off.
60	" " "	4-in.	Set for Shut-off.
1	" " "	3-in.	For Blow-off.
1	Michigan Brass and Iron Works.....	10-in.	Set for Shut-off.
8	" " "	8-in.	" "
51	" " "	6-in.	" "
11	" " "	4-in.	" "
637	Total.		

TABLE OF OLD GATES RESET FOR SHUT AND BLOW-OFFS.

No. of each kind.	NAME OF GATE.	SIZE.	REMARKS.
1	Flowers Bros.....	6-in.	Reset Shut-off.
1	" "	4-in.	" "
5	" "	4-in.	Reset Blow-off.
2	" "	4-in.	Set Blow-off.
2	" "	3-in.	" "
6	Murdock Valve Company.....	6 in.	Reset Shut-off.
1	" " "	6-in.	Set Blow-off.
1	" " "	4-in.	Reset Shut-off.
22	" " "	4-in.	Set Blow-off.
10	" " "	4-in.	Reset Blow-off.
1	Galvin Bros.....	4-in.	Set Blow-off.
1	Pittsburgh.....	12-in.	" "
1	"	4-in.	Reset Blow-off.
1	Michigan Brass and Iron Works.....	6-in.	Reset Shut-off.
1	" " " "	4-in.	Set Blow-off.
56	Total.		

TABLE OF GATES TAKEN OUT.

No. of each kind.	NAME OF GATE.	SIZE.
1	Flowers Bros.....	6-in.
49	" "	4 in.
6	" "	3 in.
1	Eddy.....	6-in.
1	Murdock Valve Company.....	8 in.
7	" " "	6-in.
91	" " "	4-in.
1	" " "	3-in.
20	Pittsburgh.....	4-in.
26	Galvin Bros.....	4-in.
13	Ludlow.....	4-in.
3	Michigan Brass and Iron Works.....	6-in.
5	" " " "	4-in.
1	Scowden.....	10-in.
5	"	6 in.
1	"	4 in.
1	Prong.....	10 in.
232	Total.	

GATES IN SYSTEM TO JANUARY 1, 1895.

	43-In.	36-In.	30-In.	24-In.	20-In.	18-In.	16-In.	12-In.	10-In.	8-In.	6-In.	4-In.	3-In.	TOTAL	PER CENT.
Murlock	4	...	11	16	...	...	24	19	154	401	1,455	1,227	9	3,820	59.820
Flowers	20	...	10	18	...	...	...	...	39	52	244	447	22	852	15.352
Galvin Bros .....	...	1	7	12	...	...	21	...	12	32	171	276	1	538	9.003
Michigan Brass and Iron Works ..	...	...	...	...	10	...	7	5	22	25	352	98	...	519	9.852
Pittsburgh .....	...	...	...	13	...	2	1	1	9	11	31	133	...	201	3.622
Eddy .....	...	...	...	1	...	...	...	...	15	4	6	9	...	35	0.630
Scowden .....	...	...	...	...	...	...	...	...	3	3	...	...	...	6	0.108
Ludlow .....	...	...	...	...	...	...	...	...	1	3	11	13	...	28	0.504
Prong .....	...	...	...	...	...	...	...	...	...	...	1	...	...	1	0.018
Boston .....	...	...	...	...	...	...	...	...	...	1	1	...	...	2	0.036
Newport .....	...	...	...	...	...	...	...	...	...	...	...	1	...	1	0.018
No Name .....	...	...	...	...	...	...	...	...	...	3	9	39	1	52	0.937
TOTAL	21	1	24	60	10	2	53	25	255	535	2,281	2,243	33	5,550	100.000

The last-mentioned table gives the total number of water-gates in the pipeage system, name of maker, number of each size, and percentage of each manufacture. The following table gives the length of 3-, 4- and 6-inch pipe and logs which have been replaced with pipe of larger size, in detail, as follows:

SIZE OF PIPE LAID.	SIZE OF PIPE AND LOGS REPLACED.	LENGTH OF PIPE LAID.
4-inch iron pipe.....	3-inch iron pipe.....	5 feet.
4 " " ".....	Log pipe.....	2,928 "
6 " " ".....	3-inch iron pipe.....	4,640 "
6 " " ".....	4 " " ".....	12,210 "
6 " " ".....	Log pipe.....	14,295 "
8 " " ".....	3-inch iron pipe.....	230 "
8 " " ".....	4 " " ".....	12,634 "
8 " " ".....	6 " " ".....	359 "
8 " " ".....	Log pipe.....	1,953 "
10 " " ".....	3-inch iron pipe.....	386 "
10 " " ".....	4 " " ".....	5,174 "
10 " " ".....	6 " " ".....	2,451 "
12 " " ".....	4 " " ".....	1,871 "
12 " " ".....	6 " " ".....	1,104 "
16 " " ".....	4 " " ".....	4,669 "
16 " " ".....	6 " " ".....	60 "
TOTAL.....		64,414 "

I take the liberty of drawing your attention to some statements which appeared in the last Annual Report, and which I think were unadvisably made, as the showing of the past year's work will forcibly reveal. I refer to the large percentages of the pipe-joints said to be found leaking. The past year's work of replacing eight and a half miles of pipe, more than seven-eighths of which was exposed and also taken out, failed to develop five per cent. of such leaks, as well also the numerous service connections in this length of pipe. I think two per cent. would have been nearer correct. I simply make this statement in justice to myself, from the severe criticism which appear in a previous report.

The men whom I have employed as calkers are very efficient

in this class of work, as well as pipe-fitters. Several of these men have had more than twenty years' experience, and have been that length of time in the employ of the works, and I believe their highest ambition is to know that their work is approved. I would also state that any intricate work, such as the cross-street intersections, and all such special work, is left exposed until tested.

REPAIR DEPARTMENT.

Owing to your readjustment of the different branches of the works, the supervision of the Repair Department will now appear with the Meter Department.

The work of this Department while under my care, with Mr. John Wallace as its chief foreman and his corps of faithful men, the numerous items of work falling to this department were efficiently met.

PUMPING WORKS.

Since the completion of the last connection of the 42-inch mains to the No. 4 Engine and the suction pipe, I have had but little work to do at this place.

It would be a breach of courtesy not to mention your kindness and forbearance of the many calls we have had to make upon your attention. I am pleased to say, that the co-operation with the Civil Engineering and the Meter and Repair Departments has been of a pleasant character.

Transmitted with this report are the locations of the pipe-age of the city to January 2, 1895.

Respectfully submitted.

HENRY BRIDGE,
Superintendent of Extensions.

VALUATION OF THE WORKS.

AGGREGATES.

Real estate.....	\$418,427 29
Oil plant.....	14,649 29
Buildings, docks, basins, conduits, force mains at pumping works.....	853,602 69
Water pipe laid and in use.....	8,356,355 65
Meters placed and in use.....	85,087 03

TOOLS AND MATERIALS ON HAND.

Office furniture and fixtures	10,767 00
In Repair Department.....	542 15
In Meter Department.....	1,699 20
In Service Cocks Department.....	1,772 85
In Iron Pipe Department.....	25,222 69
In Pumping Water and Works Department	25,257 17
In Hurlbut Fund Department	555 48
Horses, vehicles and harness.....	5,969 00

Aggregate.....	\$4,795,507 49
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The above valuation consists in details as follows:

REAL ESTATE.

Office building and lot.....	\$60,000 00
Orleans street lots.....	33,750 00
Storage grounds and improvements.....	48,200 00
Pumping works grounds and improvements....	271,477 29
	\$418,427 29

OIL PLANT.

Pumping station house, engines and pipes, tanks and fixtures at works.....	\$14,649 29
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PUMPING WORKS.

Buildings, dock, basin, conduits, pipe, etc.....	\$853,602 69
Tools.....	1,103 25
Materials: Rope, waste, etc.....	928 78
Gauges, valves, etc.....	815 85
Iron, lead, etc.....	815 68
Furniture.....	300 00
Wood and coal.....	14,823 40

Fuel oil 135,661 gals.....	\$2,412 74
Housing engines, pony pumps and boilers, electric light plant and stock, gas machines, etc.	4,057 47
Tools and materials—Huribut Fund.....	555 48

\$379,415 84

OFFICE BUILDING.

Quarter	in office.....	\$1,000 00
Fourteen office tables	" "	215 00
Six book cases	" "	600 00
Three wardrobes	" "	235 00
Nine desks	" "	242 00
Thirty six chairs	" "	91 50
Thirteen office stools	" "	40 00
Eight city maps	" "	20 00
One marble clock	" "	100 00
Four atlas maps	" "	100 00
Partitions and railings	" "	800 00
Heating apparatus	" "	1,400 00
Electric light fixtures	" "	85 00
Miscellaneous properties	" "	100 00
Furniture in board room.....		575 00
4 stools	in engineering dep't	13 00
4 drafting tables	" " "	50 00
8 drafting tables and horses	" " "	26 00
2 drafting boards	" " "	2 00
1 blue print outfit	" " "	25 74
1 case instruments	" " "	60 00
2 rolls vellum	" " "	15 50
5 tee squares	" " "	6 25
1 roll oil cloth	" " "	2 00
2 straight edges	" " "	2 00
2 tape lines	" " "	2 25
2 readers	" " "	2 35
1 desk chair and stool	" " "	40 25
1 table	" " "	27 00
1 drafting table	" " "	15 00
5 chairs	" " "	15 00
Cases of maps, drawings and records	" "	1,500 00
1 case for drawings	" " "	80 00
Maps and drawings	" " "	2,500 00
Instruments	" " "	330 00
Clock	" " "	12 00
1 safe and hat rack	" " "	28 50
1 case for filing reports	" " "	25 00
1 wash stand	Sup't of Ex. room..	26 66
5 desks	" " " " ..	100 00
1 table	" " " " ..	4 50

10 chairs	Sup't of Ex. room..	\$23 00
2 pigeon hole cases	" " " " ..	8 00
1 copy press book and stand	" " " " ..	10 00
Ink and ink wells	" " " " ..	7 50
Blanks, stationery, etc.	" " " " ..	50 00
		<hr/> \$10,767 00

REPAIR DEPARTMENT.

2 sleighs	\$25 00
2 sets runners	20 00
4 horse blankets (old)	4 00
2 sets calking tools	1 50
336 lbs. pig lead	9 84
819 lbs. scrap lead	24 57
35 lbs. sheet lead	1 50
205 lbs. wiping solder	1 00
35 lbs. strap solder	1 00
180 lbs. 1½ in. lead pipe	9 40
35 lbs. 1 in. lead pipe	1 75
70 lbs. ¾ in. lead pipe	3 50
8 ladles	12 00
2 plumbers' fire pots	10 00
12 diamond point chisels	12 00
12 flat chisels	6 00
1 anvil	2 50
2 vises	8 00
29 gate keys	35 00
14 street keys	14 00
2 pumps	37 40
15 hydrant wrenches	5 50
8 dippers	4 00
4 pairs rubber boots	12 00
2 leather coats	8 00
18 shovels	11 70
8 picks ..	8 00
5 pounders	5 00
4 pounder handles	80
19 lanterns and 20 red globes	19 00
2 saws	1 25
1 draw knife	50
1 rope ladder	1 00
1 log rimmer	1 75
1 platform scales	25 00
2 force pumps	8 00
1 grindstone	1 25
10 water pails	2 00
70 ft. ¾ in. hose	5 00

Fuel oil (155,661 gals.).....	\$3,413 74
Hoisting engines, pony pumps and boilers, electric light plant and stock, gas machines, etc.	4,057 47
Tools and materials—Hurlbut Fund.....	555 48
	\$879,415 34

OFFICE BUILDING.

Counter	in office.....	\$1,000 00
Fourteen office tables	" "	215 00
Six book cases	" "	600 00
Three wardrobes	" "	835 00
Nine desks	" "	242 00
Thirty-six chairs	" "	91 50
Thirteen office stools	" "	40 00
Eight city maps	" "	20 00
One marble clock	" "	100 00
Four atlas maps	" "	100 00
Partitions and railings	" "	800 00
Heating apparatus	" "	1,400 00
Electric light fixtures	" "	85 00
Miscellaneous properties	" "	100 00
Furniture in board room.....		575 00
4 stools	in engineering dep't	12 00
4 drafting tables	" " "	50 00
3 drafting tables and horses	" " "	26 00
2 drafting boards	" " "	2 00
1 blue print outfit	" " "	25 74
1 case instruments	" " "	60 00
2 rolls vellum	" " "	15 50
5 tee squares	" " "	6 25
1 roll oil cloth	" " "	2 00
2 straight edges	" " "	2 00
2 tape lines	" " "	2 25
2 readers	" " "	2 35
1 desk chair and stool	" " "	40 25
1 table	" " "	27 00
1 drafting table	" " "	15 00
5 chairs	" " "	15 00
Cases of maps, drawings and records	" "	1,500 00
1 case for drawings	" " "	80 00
Maps and drawings	" " "	2,500 00
Instruments	" " "	330 00
Clock	" " "	12 00
1 safe and hat rack	" " "	28 50
1 case for filing reports	" " "	25 00
1 wash stand	Sup't of Ex. room..	35 66
5 desks	" " " " ..	100 00
1 table	" " " " ..	4 50

10 chairs	Sup't of Ex. room..	\$23 00
2 pigeon hole cases	" " " " ..	8 00
1 copy press book and stand	" " " " ..	10 00
Ink and ink wells	" " " " ..	7 50
Blanks, stationery, etc.	" " " " ..	50 00

\$10,767 00

REPAIR DEPARTMENT.

2 sleighs	\$25 00
2 sets runners	20 00
4 horse blankets (old)	4 00
2 sets calking tools	1 50
328 lbs. pig lead	9 84
819 lbs. scrap lead	24 57
35 lbs. sheet lead	1 50
205 lbs. wiping solder	1 00
35 lbs. strap solder	1 00
180 lbs. 1½ in. lead pipe	9 40
35 lbs. 1 in. lead pipe	1 75
70 lbs. ¾ in. lead pipe	8 50
8 ladles	12 00
2 plumbers' fire pots	10 00
13 diamond point chisels	12 00
12 flat chisels	6 00
1 anvil	2 50
2 vises	8 00
29 gate keys	35 00
14 street keys	14 00
2 pumps	37 40
15 hydrant wrenches	5 50
8 dippers	4 00
4 pairs rubber boots	12 00
2 leather coats	8 00
18 shovels	11 70
8 picks ..	8 00
5 pounders	5 00
4 pounder handles	80
19 lanterns and 20 red globes	19 00
2 saws	1 25
1 draw knife	50
1 rope ladder	1 00
1 log rimmer	1 75
1 platform scales	25 00
2 force pumps	8 00
1 grindstone	1 25
10 water pails	2 00
70 ft. ¾ in. hose	5 00

1 sledge	\$1 00
1 8-in. bolted sleeve	8 15
1 6-in. bolted sleeve	2 00
14 4-in. bolted sleeves	15 75
8 8-in. bolted sleeves	82
8 8-in. plain sleeves	1 75
4 4-in. plain sleeves	2 25
1 8-in. plain sleeve	1 76
1 4-in. curve	1 16
1 8-in. bend	90
8 6-in. Flowers gate stems	5 25
8 4-in. Flowers gate stems	5 25
4 6-in. Mich. Brass & Iron Works stems	9 60
4 4-in. Mich. Brass & Iron Works stems	7 00
5 4-in. Murdock gate stems	8 75
8 4-in. Murdock gates	18 00
1 6-in. Murdock gate	9 00
8 4-in. Flowers' gates	18 00
5 4-in. stuffing boxes, M. B.	8 75
6 8-in. stuffing boxes, M. B.	6 00
6 6-in. stuffing boxes, M. B.	4 80
8 4-in. Murdock gate stuffing boxes	2 25
8 prong keys	3 00
8 crowbars	2 75
1 machine for raising gate boxes	3 00
2 axe handles	50
2 axes	2 00
2 4-in. caps for iron pipe	1 00
2 gate boxes	6 00
6 rubber discs for pumps, No. 1	18 00
6 rubber discs for pumps, No. 2	18 00

\$542 15

SERVICE COCKS.

1 Smith tapping machine	\$850 00
1 2x4 Smith sleeve and valve	9 00
1 3x4 " " " "	10 00
1 4x4 " " " "	12 00
1 2x6 " " " "	11 50
1 3x6 " " " "	12 50
1 4x6 " " " "	16 00
1 2x8 " " " "	12 00
2 3x8 " " " "	28 00
1 4x8 " " " "	18 00
1 6x8 " " " "	23 00
1 2x10 " " " "	16 00
1 3x10 " " " "	18 00
1 4x10 " " " "	22 00

3 Mueller tapping machines.....	\$255 00
1 30-in. saddle	1 00
2 24-in. "	2 00
2 16-in. "	2 00
2 12-in. "	2 00
3 10-in. "	3 00
3 8-in. "	3 00
3 6-in. "	3 00
3 4-in. "	3 00
3 3-in. "	3 00
5 yokes.....	5 00
3 pressure wrenches.....	1 50
3 handles for turning taps	50
8 1-in. drills and taps..... at \$3 00	24 00
8 1/2-in. " " "	2 00
2 1/2 in. " " "	now 4 00
2 1/2-in. taps.....	1 50
2 1/2-in. drills and taps.....	1 75
215 1-in. service cocks.....	90
63 1/2-in. " "	45
1 emery wheel and spindle.....	2 00
5 oil cans.....	1 00
2 pairs rubber boots.....	8 00
2 horse blankets.....	9 00
5 monkey wrenches.....	3 75
2 leather jackets.....	5 00
1 Stilson wrench.....	75
8 blankets.....	24 00
8 robes.....	24 00
8 picks.....	4 00
8 spades.....	6 00
8 street keys.....	12 00
6 rubber covers for horses.....	12 00
8 rubber aprons for buggies	12 00
8 tape lines.....	6 00
8 pipe gauges.....	24 00

 \$1,772 85

METER DEPARTMENT.

Meters placed and in use	\$85,687 03
1 foot lathe.....	\$90 00
1 chuck (Cushman).....	6 00
1 chuck (drill).....	3 00
Drills, tools and taps.....	3 50
1 lathe clamp.....	1 12
1 screw chaser	25
1 plug.....	90

I am glad it has appeared wise to you to place the care of our water-gates, and the appurtenances thereto, in competent hands. The unskillful handling of this branch of the pipe system during the early part of last year, and the latter part of the previous year, has been the cause of endless annoyances. I am now looking forward, with special interest, to the abatement of the former annoyances. Mr. John Bridge, whom you have appointed Superintendent of this Department, with his practical mechanical abilities, should be sufficient guarantee that this branch of the works is in efficient hands.

Owing to the cause of some unforeseen changes in the office of this Department during the past year, it has in some measure complicated our work, which for a time has been a source of additional care. I trust, however, that the opening season, with our increased force of clerical help, under the efficient supervision of Mr. A. W. Goodsell, will be the means of a complete and satisfactory showing of this Department work.

TABLE OF NEW GATES SET FOR SHUT-OFFS.

No. of each kind.	NAME OF GATE.	SIZE.	REMARKS.
10	Murdock Valve Company.....	16-in.	Set for Shut-off.
7	" " "	12-in.	" "
84	" " "	10-in.	" "
78	" " "	8-in.	" "
380	" " "	6-in.	" "
1	" " "	6-in.	For Blow-off.
60	" " "	4-in.	Set for Shut-off.
1	" " "	3-in.	For Blow-off.
1	Michigan Brass and Iron Works.....	10-in.	Set for Shut-off.
8	" " "	8-in.	" "
51	" " "	6-in.	" "
11	" " "	4-in.	" "
637	Total.		

TABLE OF OLD GATES RESET FOR SHUT AND BLOW-OFFS.

No. of each kind.	NAME OF GATE.	SIZE.	REMARKS.
1	Flowers Bros.....	6-in.	Reset Shut-off.
1	" "	4-in.	" "
5	" "	4-in.	Reset Blow-off.
2	" "	4-in.	Set Blow-off.
2	" "	8-in.	" "
6	Murdock Valve Company.....	6-in.	Reset Shut-off.
1	" " "	6-in.	Set Blow-off.
1	" " "	4-in.	Reset Shut-off.
22	" " "	4-in.	Set Blow-off.
10	" " "	4-in.	Reset Blow-off.
1	Galvin Bros.....	4-in.	Set Blow-off.
1	Pittsburgh.....	12-in.	" "
1	"	4-in.	Reset Blow-off.
1	Michigan Brass and Iron Works.....	6-in.	Reset Shut-off.
1	" " " "	4-in.	Set Blow-off.
56	Total.		

TABLE OF GATES TAKEN OUT.

No. of each kind.	NAME OF GATE.	SIZE.
1	Flowers Bros.....	6-in.
49	" "	4 in.
6	" "	3 in.
1	Eddy	6-in.
1	Murdock Valve Company.....	8 in.
7	" " "	6-in.
91	" " "	4-in.
1	" " "	8-in.
20	Pittsburgh.....	4-in.
26	Galvin Bros.....	4-in.
18	Ludlow.....	4-in.
3	Michigan Brass and Iron Works.....	6-in.
5	" " " "	4-in.
1	Scowden.....	10-in.
5	"	6 in.
1	"	4-in.
1	Prong.....	10 in.
232	Total.	

The last-mentioned table gives the total number of water-gates in the pipeage system, name of maker, number of each size, and percentage of each manufacture. The following table gives the length of 3-, 4- and 6-inch pipe and logs which have been replaced with pipe of larger size, in detail, as follows:

SIZE OF PIPE LAID.	SIZE OF PIPE AND LOGS REPLACED.	LENGTH OF PIPE LAID.
4-inch iron pipe.....	3-inch iron pipe.....	5 feet.
4 " " ".....	Log pipe.....	2,923 "
6 " " ".....	3-inch iron pipe.....	4,640 "
6 " " ".....	4 " " ".....	12,210 "
6 " " ".....	Log pipe.....	14,295 "
8 " " ".....	3-inch iron pipe.....	230 "
8 " " ".....	4 " " ".....	12,634 "
8 " " ".....	6 " " ".....	359 "
8 " " ".....	Log pipe.....	1,953 "
10 " " ".....	3-inch iron pipe.....	386 "
10 " " ".....	4 " " ".....	5,174 "
10 " " ".....	6 " " ".....	2,451 "
12 " " ".....	4 " " ".....	1,371 "
12 " " ".....	6 " " ".....	1,104 "
16 " " ".....	4 " " ".....	4,669 "
16 " " ".....	6 " " ".....	60 "
TOTAL.....	.....	64,414 "

I take the liberty of drawing your attention to some statements which appeared in the last Annual Report, and which I think were unadvisably made, as the showing of the past year's work will forcibly reveal. I refer to the large percentages of the pipe-joints said to be found leaking. The past year's work of replacing eight and a half miles of pipe, more than seven-eighths of which was exposed and also taken out, failed to develop five per cent. of such leaks, as well also the numerous service connections in this length of pipe. I think two per cent. would have been nearer correct. I simply make this statement in justice to myself, from the severe criticism which appear in a previous report.

The men whom I have employed as calkers are very efficient

in this class of work, as well as pipe-fitters. Several of these men have had more than twenty years' experience, and have been that length of time in the employ of the works, and I believe their highest ambition is to know that their work is approved. I would also state that any intricate work, such as the cross-street intersections, and all such special work, is left exposed until tested.

REPAIR DEPARTMENT.

Owing to your readjustment of the different branches of the works, the supervision of the Repair Department will now appear with the Meter Department.

The work of this Department while under my care, with Mr. John Wallace as its chief foreman and his corps of faithful men, the numerous items of work falling to this department were efficiently met.

PUMPING WORKS.

Since the completion of the last connection of the 42-inch mains to the No. 4 Engine and the suction pipe, I have had but little work to do at this place.

It would be a breach of courtesy not to mention your kindness and forbearance of the many calls we have had to make upon your attention. I am pleased to say, that the co-operation with the Civil Engineering and the Meter and Repair Departments has been of a pleasant character.

Transmitted with this report are the locations of the pipe-age of the city to January 2, 1895.

Respectfully submitted.

HENRY BRIDGE.
Superintendent of Extensions.

VALUATION OF THE WORKS.

AGGREGATES.

Real estate.....	\$413,427 29
Oil plant.....	14,649 29
Buildings, docks, basins, conduits, force mains at pumping works.....	853,602 69
Water pipe laid and in use.....	3,356,355 65
Meters placed and in use.....	85,687 03

TOOLS AND MATERIALS ON HAND.

Office furniture and fixtures.....	10,767 00
In Repair Department.....	542 15
In Meter Department.....	1,699 20
In Service Cocks Department.....	1,772 85
In Iron Pipe Department.....	25,222 69
In Pumping Water and Works Department.....	25,257 17
In Hurlbut Fund Department.....	555 48
Horses, vehicles and harness.....	5,969 00

Aggregate.....	\$4,795,507 49
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The above valuation consists in details as follows:

REAL ESTATE.

Office building and lot.....	\$60,000 00
Orleans street lots.....	33,750 00
Storage grounds and improvements.....	48,200 00
Pumping works grounds and improvements.....	271,477 29
	\$413,427 29

OIL PLANT.

Pumping station house, engines and pipes, tanks and fixtures at works.....	\$14,649 29
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PUMPING WORKS.

Buildings, dock, basin, conduits, pipe, etc.	\$853,602 69
Tools.....	1,103 25
Materials: Rope, waste, etc.....	928 78
Gauges, valves, etc.....	815 85
Iron, lead, etc.....	815 68
Furniture.....	300 00
Wood and coal.....	14,823 40

Fuel oil (155,661 gals.).....	\$2,413 74
Holisting engines, pony pumps and boilers, electric light plant and stock, gas machines, etc.	4,057 47
Tools and materials—Hurlbut Fund.....	555 48
	\$679,415 34

OFFICE BUILDING.

Counter	in office.....	\$1,000 00
Fourteen office tables	" "	215 00
Six book cases	" "	600 00
Three wardrobes	" "	335 00
Nine desks	" "	242 00
Thirty-six chairs	" "	91 50
Thirteen office stools	" "	40 00
Eight city maps	" "	20 00
One marble clock	" "	100 00
Four atlas maps	" "	100 00
Partitions and railings	" "	800 00
Heating apparatus	" "	1,400 00
Electric light fixtures	" "	85 00
Miscellaneous properties	" "	100 00
Furniture in board room.....		575 00
4 stools	in engineering dep't	13 00
4 drafting tables	" " "	50 00
3 drafting tables and horses	" " "	26 00
2 drafting boards	" " "	2 00
1 blue print outfit	" " "	25 74
1 case instruments	" " "	60 00
2 rolls vellum	" " "	15 50
5 tee squares	" " "	6 25
1 roll oil cloth	" " "	2 00
2 straight edges	" " "	2 00
2 tape lines	" " "	2 25
2 readers	" " "	2 35
1 desk chair and stool	" " "	40 25
1 table	" " "	27 00
1 drafting table	" " "	15 00
5 chairs	" " "	15 00
Cases of maps, drawings and records	" "	1,500 00
1 case for drawings	" " "	80 00
Maps and drawings	" " "	2,500 00
Instruments	" " "	330 00
Clock	" " "	12 00
1 safe and hat rack	" " "	28 50
1 case for filing reports	" " "	25 00
1 wash stand	Sup't of Ex. room..	26 66
5 desks	" " " " ..	100 00
1 table	" " " " ..	4 50

10 chairs	Sup't of Ex. room..	\$28 00
2 pigeon hole cases	" " " " ..	8 00
1 copy press book and stand	" " " " ..	10 00
Ink and ink wells	" " " " ..	7 50
Blanks, stationery, etc.	" " " " ..	50 00
		<hr/>
		\$10,767 00

REPAIR DEPARTMENT.

2 sleighs	\$25 00
2 sets runners	20 00
4 horse blankets (old)	4 00
2 sets calking tools	1 50
336 lbs. pig lead	9 84
819 lbs. scrap lead	24 57
35 lbs. sheet lead	1 50
205 lbs. wiping solder	1 00
35 lbs. strap solder	1 00
180 lbs. 1½ in. lead pipe	9 40
35 lbs. 1 in. lead pipe	1 75
70 lbs. ¾ in. lead pipe	8 50
8 ladles	12 00
2 plumbers' fire pots	10 00
12 diamond point chisels	12 00
12 flat chisels	6 00
1 anvil	2 50
2 vices	8 00
29 gate keys	35 00
14 street keys	14 00
2 pumps	37 40
15 hydrant wrenches	5 50
8 dippers	4 00
4 pairs rubber boots	12 00
2 leather coats	8 00
18 shovels	11 70
8 picks ..	8 00
5 pounders	5 00
4 pounder handles	80
19 lanterns and 20 red globes	19 00
2 saws	1 25
1 draw knife	50
1 rope ladder	1 00
1 log rimmer	1 75
1 platform scales	25 00
2 force pumps	8 00
1 grindstone	1 25
10 water pails	2 00
70 ft. ¾ in. hose	5 00

1 sledge	\$1 00
1 8-in. bolted sleeve	3 15
1 6-in. bolted sleeve	2 00
14 4-in. bolted sleeves	15 75
3 3-in. bolted sleeves	82
3 3-in. plain sleeves	1 75
4 4-in. plain sleeves	2 25
1 8-in. plain sleeve	1 76
1 4-in. curve	1 16
1 3-in. bend	90
3 6-in. Flowers gate stems	5 25
3 4-in. Flowers gate stems	5 25
4 6-in. Mich. Brass & Iron Works stems	9 60
4 4-in. Mich. Brass & Iron Works stems	7 00
5 4-in. Murdock gate stems	8 75
3 4-in. Murdock gates	18 00
1 6-in. Murdock gate	9 00
3 4-in. Flowers' gates	18 00
5 4-in. stuffing boxes, M. B.	8 75
6 8-in. stuffing boxes, M. B.	6 00
6 6-in. stuffing boxes, M. B.	4 80
3 4-in. Murdock gate stuffing boxes	2 25
3 prong keys	3 00
3 crowbars	2 75
1 machine for raising gate boxes	3 00
2 axe handles	50
2 axes	2 00
2 4-in. caps for iron pipe	1 00
2 gate boxes	6 00
6 rubber discs for pumps, No. 1	18 00
6 rubber discs for pumps, No. 2	18 00

\$542 15

SERVICE COCKS.

1 Smith tapping machine	\$830 00
12x4 Smith sleeve and valve	9 00
1 3x4 " " " "	10 00
1 4x4 " " " "	13 00
1 2x6 " " " "	11 50
1 3x6 " " " "	12 50
1 4x6 " " " "	16 00
1 2x8 " " " "	12 00
2 3x8 " " " "	28 00
1 4x8 " " " "	18 00
1 6x8 " " " "	23 00
1 2x10 " " " "	16 00
1 3x10 " " " "	18 00
1 4x10 " " " "	22 00

3 Mueller tapping machines.....	\$255 00	
1 30-in. saddle	1 00	
2 24-in. "	2 00	
2 16-in. "	2 00	
2 12-in. "	2 00	
3 10-in. "	3 00	
3 8-in. "	3 00	
3 6-in. "	3 00	
3 4-in. "	3 00	
3 3-in. "	3 00	
5 yokes... ..	5 00	
3 pressure wrenches.....	1 50	
3 handles for turning taps	50	
8 1-in drills and taps..... at \$3 00	24 00	
8 1/2-in. " " "	2 00	16 00
2 1/2 in. " " "	now 4 00	8 00
2 1/2-in. taps	1 50	8 00
2 1/2-in. drills and taps	1 75	3 50
215 1-in. service cocks.....	90	193 50
63 1/2-in. " "	45	28 35
1 emery wheel and spindle.....	2 00	
5 oil cans.....	1 00	
2 pairs rubber boots.....	8 00	
2 horse blankets.....	9 00	
5 monkey wrenches.....	3 75	
2 leather jackets	5 00	
1 Stilson wrench.....	75	
8 blankets	24 00	
8 robes.....	24 00	
8 picks.....	4 00	
8 spades.....	6 00	
8 street keys.....	12 00	
6 rubber covers for horses.....	12 00	
8 rubber aprons for buggies	12 00	
8 tape lines.....	6 00	
8 pipe gauges.....	24 00	
		<hr/>
		\$1,772 85

METER DEPARTMENT.

Meters placed and in use		\$85,687 03
1 foot lathe.....	\$90 00	
1 chuck (Cushman).....	6 00	
1 chuck (drill).....	3 00	
Drills, tools and taps.....	3 50	
1 lathe clamp.....	1 12	
1 screw chaser	25	
1 plug.....	90	

1 1-inch stock and dies.....	}	\$30 00
1 2-inch stock and dies.....		
1 ratchet, stock and dies.....		
1 1-inch pipe cutter.....		
1 2-inch pipe cutter.....		
1 2-inch and 1 3-inch cutter—2-inch \$5.00, 3-inch \$12.00.....		17 00
1 6-inch cutter.....		15 00
28 cutter wheels..... at 25 cts.		7 00
1 6-inch monkey wrench.....		50
1 12-inch monkey wrench.....		75
1 8-inch monkey wrench (Westcott).....		75
1 8-inch pipe wrench (Westcott).....		75
1 12-inch pipe trim wrench.....		75
2 18-inch monkey wrenches..... at \$2 50		5 00
2 pairs No. 8 chain tongs..... at 6 00		12 00
8 pairs gas tongs..... at 50 cts.		1 50
1 1/4-inch gas tap.....		37
1 1/2-inch gas tap.....		42
1 2-inch gas tap.....		2 50
4 small ladles for fire pots..... at 25 cts.		1 00
2 ladles for making calk joints..... at 75 cts.		1 50
4 fire pots..... at \$5 00		20 00
5 hand pumps..... at \$2 00		10 00
2 sets calking tools..... at 30 cts.		60
1 calking hammer.....		3 00
1 pair snips.....		2 50
8 hand lanterns..... at 30 cts.		2 40
1 4-inch gate key.....		4 00
1 long gate key and 4 short gate keys.....		5 50
2 pair hip boots (old).....		2 00
1 chain fall.....		10 00
1 electric lamp.....		10 00
1 bench vise.....		8 00
1 breast drill.....		2 50
1 pipe vise.....		10 00
1 washer cutter.....		50
6 hand saws..... at \$1 25		7 50
2 broad axes..... " 1 00		2 00
1 watch tackle and rope.....		8 00
2 hollow punches.....		1 50
2 screw drivers.....		40
2 crow foot wrenches.....		1 00
2 cold chisels.....		60
1 5-gal. gasoline can.....		25
8 combination meter box wrenches..... at \$2 00		16 00
1 extension bit.....		2 50
1 jack plane.....		50

1-in. woodchisel	\$0 50
1 hydrant wrench.....	50
1-2 ft. try square	1 00
1 saw set	75
1 water motor.....	50 00
1 claw hammer	50
1 bailing dipper	1 00
1 sun shade for wagon.....	2 00
Blankets and robe.....	8 00
Rubber cover.....	1 00
80 iron couplings.	4 85
77 unions	12 10
88 elbows	6 14
68 street elbows	5 69
71 angle elbows.....	9 80
26 tees	2 50
168 iron nipples	9 58
98 bushings	6 20
135 reducers and odd fittings.....	16 27
9 meter box covers.....	19 60
8 2-in. sleeves..	2 86
8 4-in. sleeves	3 27
11 2-in expansion joints	3 77
4 3-in expansion joints	2 45
1 4-in. expansion joint.....	98
14 pipe flanges.....	1 70
Wire spikes	85
8d nails	37
Wiping solder.....	6 84
Block tin.....	1 63
Lead pipe	11 56
1 bag cement.....	60
11 check valves (Rouse).....	12 06
5 inside stop cocks.....	3 74
34 solder nipples.....	3 90
69 meter couplings.....	29 84
50 meters	990 00
5 registers, bolts, discs, etc.....	78 90
Lumber.....	13 60
2 bicycles.....	50 00

 \$1,699 20

IRON PIPE DEPARTMENT.

PIPE IN GROUND.

103 feet 45-in. pipe	\$1,699 50
45.207 " 42 "	660,196 40
715 " 36 "	6,587 35

49,387 feet 30-in. pipe	\$332,404 86	
84,813 " 24 "	408,704 93	
461 " 20 "	1,751 80	
87 " 18 "	378 40	
45,287 " 16 "	140,163 78	
13,119 " 12 "	24,896 63	
128,584 " 10 "	199,773 41	
258,436 " 8 "	800,802 07	
1,048,453 " 6 "	751,884 23	
801,100 " 4 "	506,484 78	
78,257 " 3 "	35,973 42	
2,820 " 2 "	753 10	
		<hr/>
2,550,729 total feet.		\$3,856,855 65

STOCK AT RESERVOIR.

Iron pipe.....	\$8,197 67	
Specials.....	7,270 17	
Gates and valves.....	8,467 32	
Gate boxes.....	111 60	
Gate well covers.....	39 46	
Lead.....	3,296 11	
Packing.. ..	8 55	
Oil.....	1 30	
Coal.....	4 40	
Scrap iron.....	45 00	
Tools.....	2,898 86	
Covers and blankets for horses	85 00	
Material, lumber, cement, etc	847 25	
		<hr/>
		\$35,332 00

HORSES AND WAGONS.

1 horse, phaeton, sleigh and harness—Office..	\$305 00	
1 horse, cart, etc., and harness—Pumping Works.....	125 00	
2 horses, 1 wagon, 1 carriage, etc.—Meter...	392 00	
4 horses, 4 wagons and harness—Repairing Leaks.....	600 00	
2 horses, 2 wagons and harness, etc.—Service Cocks.....	478 00	
6 buggies, 6 carts, 6 sets of harness—Service Cocks.....	810 00	
11 horses, 11 wagons, 4 buggies and 11 harness—Iron Pipe.....	8,071 00	
1 horse, 1 cart and harness—Hurlbut Fund..	188 00	
		<hr/>
		\$5,909 00
Aggregate.....		<hr/>
		\$4,795,507 49

SUPPLEMENT.

BOARD OF MANAGEMENT OF DETROIT WATER WORKS.

Board of Trustees appointed by Common Council, February 24th, 1852; organized March 1st, 1852.

Shubael Conant, Chairman. Edmund A. Brush.
Henry Ledyard. Jas. A. Van Dyke.
 Wm. R. Noyes.

1853.

On the 16th of May, 1853, the Board of Water Commissioners of the City of Detroit was organized under an act previously approved by the Common Council and passed by the Legislature, February 14th, 1853. The term of service was determined by lot, as follows:

Jas. A. Van Dyke,	. . . . .	for 3 years.
Edmund A. Brush,	. . . . .	for 4 years.
Henry Ledyard,	. . . . .	for 5 years.
Shubael Conant,	. . . . .	for 6 years.
Wm. R. Noyes,	. . . . .	for 7 years.

Shubael Conant was elected President, who, finding the duties too arduous, resigned July 30th, and Edmund A. Brush was elected.

1854.

Edmund A. Brush, President. Jas. A. Van Dyke.
Shubael Conant. Wm. R. Noyes.
 Henry Ledyard.

1855.

Edmund A. Brush, President.	Wm. R. Noyes.
Henry Ledyard.	Jas. A. Van Dyke, died May
Shubael Conant.	8th.
A. D. Fraser, appointed to fill vacancy.	

1856.

Edmund A. Brush, President.	Alexander D. Fraser, re-ap-
Shubael Conant.	pointed May 1st, for 5 years.
Wm. R. Noyes.	Henry Ledyard.

1857.

Edmund A. Brush, President,	Henry Ledyard.
re-appointed May 1st, for 5	Alexander D. Fraser.
years.	Wm. R. Noyes.
Shubael Conant.	

1858.

Edmund A. Brush, President.	Henry Ledyard, re-appointed
Shubael Conant.	May 1st, for 5 years.
Alexander D. Fraser.	Wm. R. Noyes.

1859.

Edmund A. Brush, President.	Julius D. Morton, appointed
Alexander D. Fraser.	for 5 years.
Wm. R. Noyes.	Henry Ledyard, vacated by
Shubael Conant, term expired	removal from city, and
May 1st, and	Jno. V. Ruehle, appointed May
	1st to fill vacancy.

1860.

Edmund A. Brush, President.	Wm. R. Noyes, re-appointed
Alexander D. Fraser.	May 1st, for 5 years.
Julius D. Morton.	Jno. V. Ruehle.

1861.

Edmund A. Brush, President.	Jno. V. Ruehle, resigned Sept.
Alexander D. Fraser, re-ap-	16th, and
pointed May 1st, for 5 years.	Chauncey Hurlbut, appointed
	to fill vacancy.

1862.

Edmund A. Brush, President.	Wm. R. Noyes.
re-appointed May 1st, for 5	Julius D. Morton.
years.	Chauncey Hurlbut.
	Alexander D. Fraser.

1863.

Edmund A. Brush, President.	Chauncey Hurlbut, term ex-
Alexander D. Fraser.	pired May 1st, and
Wm. R. Noyes.	Stanley G. Wight, appointed
Julius D. Morton.	for 5 years.

1864.

Edmund A. Brush, President.	Julius D. Morton, term expired
Alexander D. Fraser.	May 1st.
Wm. R. Noyes.	Stanley G. Wight.

1865.

Edmund A. Brush, President.	Stanley G. Wight.
Wm. R. Noyes, resigned Jan.	Julius D. Morton, re-appointed
10, and Jacob S. Farrand	for 5 years from May 1st,
appointed to fill vacancy.	1864. Died Feb. 14, 1865,
Term expired May 1st. Re-	and
appointed for 5 years.	Jno. Owen, appointed to fill
Alexander D. Fraser.	vacancy.

1866.

Edmund A. Brush, President.	Stanley G. Wight.
Alexander D. Fraser, re-ap-	Jacob S. Farrand.
pointed May 1, for 5 years.	Jno. Owen.

1867.

Edmund A. Brush, President,	Jacob S. Farrand.
re-appointed May 1, for 5 yrs.	Jno. Owen.
Alexander D. Fraser.	Stanley G. Wight.

1868.

*Edmund A. Brush, President.	Jacob S. Farrand.
Stanley G. Wight, term expired	John Owen.
May 1, and	Caleb Van Husan.
Chauncey Hurlbut appointed	
for 5 years.	

*Edmund A. Brush resigned January 28, and Caleb Van Husan appointed to fill vacancy, and Alexander D. Fraser elected President.

1869.

Alexander D. Fraser, President.	Jacob S. Farrand.
Jno. Owen, re-appointed May	Caleb Van Husan.
1, for 5 years.	Chauncey Hurlbut.

1870.

Alexander D. Fraser, President.	Jno. Owen.
Jacob S. Farrand, re-appointed	Caleb Van Husan.
May 1, for 5 years.	Chauncey Hurlbut.

1871.

*Alexander D. Fraser, President.	Caleb Van Husan.
Jacob S. Farrand.	Chauncey Hurlbut.
John Owen.	

*Term expired May 1, and Samuel F. Hodge appointed for 5 years. Jacob S. Farrand elected President.

1872.

Jacob S. Farrand, President. *Caleb Van Huse.
Jno. Owen. Samuel F. Hodge.
Chauncey Hurlbut.

*Term expired May 1st, and Elija Smith appointed for 5 years.

1873.

*Chauncey Hurlbut, President. Jacob S. Farrand.
Jno. Owen. Samuel F. Hodge.
Elija Smith.

*Term expired and re-appointed. Elected President, May, 1872.

1874.

Chauncey Hurlbut, President. Jacob S. Farrand.
*Jno. Owen. Samuel F. Hodge.
Elija Smith.

*Term expired and re-appointed.

1875.

Chauncey Hurlbut, President. *Jacob S. Farrand.
Jno. Owen. Samuel F. Hodge.
Elija Smith.

*Term expired and re-appointed.

1876.

Chauncey Hurlbut, President. Jacob S. Farrand.
Jno. Owen. *Samuel F. Hodge.
Elija Smith.

*Term expired and re-appointed.

1877.

Chauncey Hurlbut, President. Jacob S. Farrand.
Jno. Owen. Samuel F. Hodge.
*Michael Martz.

*Elija Smith's term expired and Michael Martz appointed to fill vacancy.

1878.

*Chauncey Hurlbut, President. Jacob S. Farrand.
Jno. Owen. Samuel F. Hodge.

Michael Martz.

*Term expired and re-appointed.

1879.

Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. *Jas. Beatty.

*Jno. Pridgeon.

*Jno. Owen's term expired and Jno. Pridgeon appointed to fill vacancy. Samuel
F. Hodge resigned and Jas. Beatty appointed to fill vacancy.

1880.

Chauncey Hurlbut, President. *Jacob S. Farrand.
Michael Martz. Jas. Beatty.

Jno. Pridgeon.

*Term expired and re-appointed.

1881.

Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. *Jas. Beatty.

Jno. Pridgeon.

*Term expired and re-appointed.

1882.

Chauncey Hurlbut, President. Jacob S. Farrand.
*Michael Martz. Jas. Beatty.

Jno. Pridgeon.

*Term expired and re-appointed.

1883.

*Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. Jas. Beatty.

Jno. Pridgeon.

*Term expired and re-appointed.

1884.

Chauncey Hurlbut, President. Jacob S. Farrand.

Michael Martz. Jas. Beatty.

*Jno. Pridgeon.

* Term expired; Marshall H. Godfrey appointed.

1885.

*Jacob S. Farrand, President. Michael Martz.

Marshall H. Godfrey. *Edwin F. Conely.

*Samuel G. Caskey.

* Jas. Beatty died and Edwin F. Conely appointed to fill vacancy.

* Chauncey Hurlbut died and Samuel G. Caskey appointed to fill vacancy.

* Jacob S. Farrand's term expired and re-appointed.

1886.

Jacob S. Farrand, President. Michael Martz.

Marshall H. Godfrey. *Jno. Pridgeon.

Samuel G. Caskey.

* Edwin F. Conely's term expired and Jno. Pridgeon appointed to fill vacancy

1887.

Jacob S. Farrand, President. Jno. Pridgeon.

Marshall H. Godfrey. Samuel G. Caskey.

*Joseph Nagel.

* Michael Martz's term expired and Joseph Nagel appointed to fill vacancy.

1888.

Jacob S. Farrand, President. Jno. Pridgeon.

Marshall H. Godfrey. *Samuel G. Caskey.

Joseph Nagel.

* Term expired and re-appointed.

1889.

Jacob S. Farrand, President. Jno. Pridgeon.

Samuel G. Caskey. Jos. Nagel.

*August Goebel.

* Marshall H. Godfrey resigned January 1, 1890. August Goebel appointed to fill vacancy. Term expired May 1st, and re-appointed.

1890.

Jno. Pridgeon, President. Samuel G. Caskey.
Joseph Nagel. August Goebel.
*Henry M. Duffield.

* Jacob S. Farrand's term expired, and Col. Duffield was appointed to fill vacancy. July 9th, 1890; Jno. Pridgeon resigned as President of the Board, on account of ill-health, and Henry M. Duffield was elected to fill vacancy.

1891.

Henry M. Duffield, President. *Jno. Pridgeon.
August Goebel. Samuel G. Caskey.
Joseph L. Hudson.

* Jno. Pridgeon's term expired May 1st, and Frank E. Kirby was appointed for a term of 5 years.

1892.

Samuel G. Caskey, President. Henry M. Duffield.
August Goebel. Joseph L. Hudson.
Frank E. Kirby.

1893.

August Goebel, President. Samuel G. Caskey.
Frank E. Kirby. Henry M. Duffield.
Joseph L. Hudson.

1894.

Henry M. Duffield, President. Frank E. Kirby.
Albert L. Stephens. De Witt H. Moreland.
Edward W. Pendleton.

CHANGES IN STREET NAMES, AND THEIR LOCATION.

PRESENT NAME.	FORMER NAME.	LOCATION.
Avery ave.....	Morley st.....	N. from Lothrop.
Bancroft ave.....	Williams ave. and Joy road.....	W. from Woodward.
Barker ave.....	Ferry ave.....	E. from McClellan.
Barry st.....	Willis ave.....	E. from McClellan.
Beals ave.....	Thorburn st.....	S. from Mack.
Beaman st.....	Sherman st.....	W. from Crane.
Belvidere ave.....	Company and Bolde aves.....	E. from McClellan.
Bingham st.....	Forest ave.....	E. from Cadillac.
Blair st.....	Palmer ave.....	E. from McClellan.
Bradley st.....	Mullett st.....	W. from Crane.
Brock st.....	Lincoln ave.....	N. from Lothrop.
Bruce st.....	Champlain st.....	W. from Crane.
Buhl st.....	Canfield ave.....	E. from Holcomb.
Burlingame ave.....	Englewood ave.....	W. from Woodward.
Cadillac ave.....	Cadillac boulevard.....	N. from Jefferson.
Calumet ave.....	Brigham st.....	W. from Third ave.
Canton ave.....	Godfrey ave.....	N. from Centerline rd.
Carlton st.....	Forest ave.....	E. from McClellan.
Carver st.....	Commonwealth ave.....	N. from Lothrop.
Chapin st.....	Hendrie and Medbury.....	E. from Fisher ave.
Clay ave.....	Pallister ave.....	E. from Woodward.
Conger st.....	Piquette ave.....	E. from Baldwin.
Cook st.....	Poplar st.....	E. from Welch ave.
Crane ave.....	Laclede ave.....	N. from Mack ave.
Crary st.....	Clinton ave.....	W. from Crane ave.
Cresswell st.....	Kirby ave.....	E. from McClellan.
Dallas st.....	Morton st.....	E. from Riopelle.
Denning st.....	Gilbert st.....	E. from Scotten.
Dillon ave.....	Lincoln ave.....	N. from Holden.
Douglas st.....	Warren ave.....	E. from McClellan.
Duncan st.....	Milwaukee ave.....	E. from Helen.
Durand st.....	Maple st.....	E. & W. from Van Dyke
Eldred st.....	Chandler st.....	W. from Junction.
Emmons st.....	Julia H. st.....	E. from McClellan.
Erskine st.....	Calhoun st.....	W. from Gratiot.
Farnsworth ave.....	Farnsworth st.....	Bet. Woodward and Mt. Elliott.
Fairbanks st.....	Lafayette place.....	E. from Scotten.
Felch st.....	Piquette.....	E. from McClellan.
Ferry ave.....	Kirby ave.....	E. from Baldwin.
Finley st.....	Custer ave.....	W. from Jos. Campau.
Fisher ave.....	Jane and Richard ave.....	N. from Mack.
Forest ave.....	Garfield ave.....	E. from McClellan.
Foster st.....	Beaufait ave.....	N. from Centerline rd.
Frederick ave.....	Fredrick st.....	Bet. Woodward and Mt. Elliott.
Gillet st.....	Blaine and Chandler.....	W. from St. Aubin.
Goodwin st.....	Hastings st.....	N. from Holbrook.
Gordon st.....	Warren ave.....	E. from Cadillac.
Goethe st.....	Elm Grove ave.....	W. from McClellan.
Granger st.....	Palmer ave.....	E. from Baldwin.
Graves st.....	Hancock ave.....	E. from Holcomb.
Greeley st.....	Riopelle st.....	N. from Reutter.
Greenwood ave.....	Crawford st.....	S. from Boulevard.
Grummond ave.....	Cleveland ave.....	W. from Woodward.
Haigh ave.....	Bigelow and Andrus.....	W. from St. Aubin.
Hamilton boulevard.....	Crawford st.....	N. from Boulevard.
Harper ave.....	Centerline road and Buttler ave.....	N. City Line.
Hecia ave.....	Harrison ave.....	N. from Merrick ave.
Hendrie ave.....	Boulevard.....	E. from Baldwin.

PRESENT NAME.	FORMER NAME.	LOCATION.
Holcomb ave.	Ackley ave.	N from Gratiot.
Homer st.	Agnes ave.	W. from Crane.
Houghton st.	Charles J. st.	E. from Holcomb.
Hyde st.	Harper and Trombly ayes	E. from Helen.
Kellogg st.	Baltimore ave.	E. from Baldwin.
Kirby st.	Farnsworth st.	E. from Baldwin.
Kitchell st.	Riopelle st.	N. from Pallister.
Laclede ave.	Parker ave.	W. from Concord.
Ladue st.	Trombly ave.	E. from Baldwin.
Lafayette ave.	Volunteer ave.	W. from McKinstry.
Laferty st.	Laferty place.	Howard to M. C. R. R.
Lambert st.	Piquette and Kanter ayes	E. from Concord.
Leach st.	Croghan st.	W. from Crane.
Lernout st.	Farnsworth st.	E. from McClellan.
Lincoln ave.	Green ave.	N. from Holden.
Longyear st.	Harper ave.	E. from Helen.
Lossing st.	Orleans st.	N. from Pallister.
Mack ave.	B-hair st.	W. from Gratiot.
Marston ave.	Lincoln ave.	W. from St. Aubin.
Mathews st.	Nacomb st.	W. from Helen.
Maxwell ave.	Morton ave.	N. from Gratiot.
Merrill st.	Seventh st.	N. from Lothrop.
Mills st.	Trombly ave.	E. from Helen.
Moffat st.	Frederick st.	E. from Holcomb.
Morley st.	Avery ave.	N. from Lothrop.
Morrell st.	Theodore st.	Bet. River & Fort sta
Morrow st.	Dequindre st.	N. from Pallister.
Murray st.	Theodore st.	E. from McClellan.
Norvell st.	Canfield ave.	E. from Van Dyke.
Oakland ave.	Jerome ave.	N. from Piquette.
Olney st.	Whitaker ave.	E. from Russell.
Palmer ave.	Ferry ave.	E. from Baldwin.
Parker ave.	Belle Isle ave.	E. from Van Dyke.
Parkman ave.	Irving and Fourth ayes.	W. from Woodward.
Phelps st.	Harper ave.	E. from Baldwin.
Philadelphia ave.	Moeller st.	E. from Russell.
Pollard st.	Horton ave.	W. from Jos Campau.
Ransom st.	Canfield ave.	E. from Cadillac.
Rivard st.	Prospect ave.	N. from Pallister.
Rohns ave.	Crane ave.	N. from Mack.
Seward ave.	Fifth ave.	W. from Woodward.
Seyburn ave.	Morroes ave.	N. from Gratiot.
Sherwood ave.	Bellevue and Cleveland	N. from Harper.
Sidney ave.	Whitaker st.	E. from Russell.
Sprague st.	Willis ave.	E. from Van Dyke.
Stanton ave.	Seventeenth st.	N. from Grand River.
Sterling ave.	Trumbull ave.	N. from Holden.
Stevens st.	Superior st.	E. from Van Dyke.
Stuart st.	Superior st.	E. & W. from Concord.
Sylvan st.	Gladstone st.	E. from Vinewood.
Sylvester st.	Alexandrine and De Vogelaer	E. from Van Dyke.
Taylor ave.	Raymond ave.	W. from Woodward.
Thirteenth st.	Laferty st.	S. from Howard.
Tonti ave.	Parker st.	E. & W. from Van Dyke.
Walbridge st.	Sargent st.	E. from Baldwin.
Warren ave.	Plymouth road.	W. from 34th.
Webb ave.	Wilkins ave.	W. from Woodward.
Wellington ave.	Reutter st.	E. from Russell.
Whipple st.	Frederick	E. from Baldwin.
Wilbur st.	Endicott ave.	E. from Line in.
Willard st.	Hancock ave.	E. from Van Dyke.
Wisner st.	Harper.	E. from Cadillac.

PIPEAGE OF THE CITY OF DETROIT,

ALPHABETED BY STREETS, SHOWING THE SIZE OF IRON AND WOOD
PIPE IN USE.

LOCATION.	DIAM. INCHES.	KIND.
A st., e. from Scotten 78 ft.....	4	iron.
" Hubbard to Vinewood.....	4	"
Aberle ave, e. from Russell 349 ft.....	4	"
Abbott st., Tenth to Cass.....	24	"
" w. from Third 20 ft.....	6	"
" alley s. of, crossing Sixth.....	6	"
" alley s. of, 196 ft. e. of e. of Twelfth to Cass.....	4	"
Adair st, the River to 10 ft. n. of s. of Jefferson.....	6	"
" 10 ft. n. of s., to 29 ft. n. of s. of Jefferson.....	4	"
Adams ave., John R. to Randolph.....	6	"
" Witherell to Hastings.....	4	"
" alley s. of, Cass to 240 ft. e. of Clifford.....	4	"
" alley s. of, John R. to Randolph.....	4	"
Adelaide st., 30 e. of w. of Woodward to 23 ft. e. of w. of Brush.....	8	"
" 22 ft. e. of w. of Brush, to 24 ft. e. of w. of Beaubien.....	10	"
" 24 ft. e. of w. of Beaubien to Orleans.....	4	"
" Orleans to 11 ft. e. of e. of same.....	18	"
" 11 ft. e. of e. of Orleans to Gratiot.....	10	"
" crossing Gratiot.....	8	"
Agnes ave., E. Boulevard to Field.....	4	"
" Baldwin to Seyburn.....	6	"
Albert st., Hammond to Wesson.....	6	"
Alexandrine ave., crossing Grand River.....	6	"
" Grand River to alley w. of Commonwealth.....	6	"
" alley w. of Commonwealth to alley w. of Trumbull.....	4	"
" alley w. of Trumbull to Seventh.....	6	"
" Seventh to Sixth.....	4	"
" Greenwood to 150 ft. w. of Fourth.....	4	"
" 150 ft. w. of Fourth to Fourth.....	3	"
" Third to Cass.....	4	"
" Cass to Woodward.....	6	"
" Woodward to John R.....	4	"
" John R. to 143 ft. w. of w. of Brush (n. side).....	6	"
" 143 ft. w. of, to Brush (n. side).....	4	"
" 143 ft. w. of, to 34 ft. e. of e. of Brush (s. side).....	6	"
" 34 ft. e. of e. of Brush to Beaubien.....	4	"
" Beaubien to 15 ft. w. of w. of St. Antoine.....	3	"
" 15 ft. w. of w. of St. Antoine, to 20 ft. w. of e. of same.....	4	"
" 20 ft. w. of e. of St. Antoine to Russell.....	6	"
" Russell to alley w. of Dubois.....	4	"
" alley w. of Dubois to Chene, w. line.....	3	"
" w. line of Chene to w. line of Grandy.....	4	"
" crossing Grandy.....	3	"
" McDougall to alley, e. of.....	6	"
" alley e. of McDougall to 367 ft. e. of e. of Moran.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Alfred st., Woodward to w. line of Brush.....	4	iron.
" crossing Brush.....	6	"
" e. line of Brush to Russell.....	4	"
" Russell to Orleans.....	3	"
" Orleans to Dubois.....	4	"
Alger ave., 16-in. main to e. line of Woodward....	6	"
" e. from Woodward 514 ft.....	4	"
" Russell to 443 ft. e. of Greeley.....	6	"
Amherst st., 23 ft. e. of w. of Cavalry to 314 ft. w. of Junction....	6	"
" 314 ft. w. of w., to Junction.....	4	"
Amsterdam st., 44 ft. w. of e. of Second to 44 ft. w. of w. of Cass.....	6	"
" 44 ft. w. of w. to e. line of Cass.....	4	"
" e. line of Cass to w. line of Woodward.....	6	"
" crossing Woodward, w. side.....	4	"
Annexation st., Junction to 540 ft. e. of e. of same.....	4	"
Anthon st., 360 ft. w. of Campbell to 360 ft. w. of Junction.....	6	"
" 360 ft. w. of w. to 30 ft. w. of e. of Junction.....	4	"
Antietam st., Rivard to 23 ft. w. of w. of McDougall.....	4	"
Antoinette st., crossing Eighteenth, e. side.....	4	"
" e. line of Eighteenth to 23 ft. e. of w. of Stanton.....	6	"
" Fifteenth to 223 ft. w. of Fourteenth.....	6	"
" 223 ft. w. of, to Fourteenth.....	4	"
" Fourteenth 138 ft. w. of Wabash.....	6	"
" 138 ft. w. of, to Wabash.....	4	"
" 193 ft. w. of, to Twelfth.....	4	"
" 43 ft. w. of e. to e. line of Second.....	4	"
" e. line of Second to Cass.....	6	"
Arlington pl., Cass to Woodward.....	"	"
Arndt st., Gratiot to 6 ft. w. of w. of Elmwood.....	6	"
" 6 ft. w. of w. of Elmwood to Mt. Elliott.....	4	"
Artillery ave., n. from River st. to Battery.....	6	"
" crossing Fort.....	6	"
" 78 ft. s. of s. to n. line of Lafayette.....	6	"
" 477 ft. s. of s. to Dix.....	8	"
Ash st., Vinewood to Twenty-seventh.....	4	"
" Twenty-fourth to e. line of Tillman.....	4	"
" Maybury to 260 ft. e. of e.....	4	"
" 260 ft. e. of e. of Maybury to Sullivan.....	3	"
" Sullivan to Humboldt.....	4	"
" Humboldt to 166 ft. e. of e. of same.....	3	"
" 166 ft. e. of e. of Humboldt to e. line of Eighteenth.....	4	"
" Eighteenth to Seventeenth.....	3	"
" Seventeenth to Sixteenth.....	4	"
" crossing Sixteenth and Fifteenth.....	4	"
" 148 ft. w. of w. to Wabash.....	4	"
" alley e. of Wabash to Twelfth.....	6	"
" Twelfth to Harrison.....	4	"
" National to alley w. of Trumbull.....	6	"
" alley e. of Trumbull to Grand River.....	4	"
Atkinson ave., 16-in. main to 21 ft. w. of Woodward.....	6	"
Atwater st., Shelby to 8 ft. w. of w. of Brush.....	6	"
" 8 ft. w. of w. of Brush to 149 ft. e. of e. of Rivard.....	4	"
" 149 ft. e. of Rivard to 33 ft. w. of e. of McDougall.....	6	"
" alley s. of, alley w. of Bates to Randolph.....	4	"
Audrain st. (in line of), Clippert to Michigan Brass and Iron Works, 1,908 ft.	4	"
Aurelia st., w. line of Thirteenth to Twelfth st.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Avery ave., 21 ft. n. of s. of Willis to 343 ft. n. of Kirby.	6	Iron.
" s. from Piquette 104 ft.	6	"
" alley w. of, Alexandrine to alley s. of Willis.	4	"
" alley w. of, Lyssander to Bunclark court.	6	"
Bst., 313 ft. w. of, to Vinewood.	4	"
Bagg st., Fifteenth to Woodward.	24	"
" crossing Greenwood on e. side.	4	"
" e. line of Greenwood to Fifth st.	3	"
Bagley ave., Grand River to Park.	8	"
" alley s. of, Cass to alley w. of Washington.	4	"
Baker st., Scotten to Hubbard.	4	"
" crossing e. side of Vinewood.	6	"
" Vinewood to Twenty-fifth.	4	"
" crossing Twenty-fifth, e. side.	6	"
" Twenty-fifth to Twenty-fourth.	4	"
" Twenty-fourth to Seventh.	8	"
" Eighth to Seventh.	4	"
" alley s. of, Fourteenth to Wabash.	4	"
" alley s. of, Tenth to Eighth.	3	"
" alley s. of, Eighth to alley w. of Fourth.	4	"
Baldwin ave., Jefferson to Waterloo.	6	"
" Mack to Gratiot.	10	"
" Gratiot to Harper.	8	"
Baltimore ave., w. from Sullivan 297 ft.	4	"
" Lincoln to w. line of Greenwood.	6	"
" Greenwood to Woodward.	4	"
" Woodward to w. line of Brush.	3	"
" crossing Brush w. side 41 ft.	6	"
" alley s. of, Greenwood to Forsyth.	6	"
Bancroft ave., 16-in. main to w. line of Woodward.	6	"
Bates st., Atwater to Farmer.	6	"
" Congress to Champlain.	30	"
" alley e. of, n. line of Atwater to alley s. of Woodbridge.	3	"
Battery st., Artillery to Dragoon.	6	"
Beacon st., crossing Brush, e. side.	6	"
" Brush to 211 ft. e. of St. Antoine.	4	"
Beals ave., s. from Mack 1,628 ft.	6	"
Beaman st., Crane to alley w. of.	4	"
Beaubien st., Atwater to Champlain, s. line.	6	"
" crossing Champlain.	8	"
" n. line of Champlain to Clinton.	6	"
" Clinton to s. line of Gratiot.	4	"
" crossing Gratiot, s. side.	6	"
" Gratiot to 14 ft. s. of n. line Madison.	8	"
" Madison to 23 ft. s. of n. line of Elizabeth.	4	"
" 31 ft. s. of n. line of Elizabeth to 23 ft. n. of s. line of Columbia.	12	"
" 23 ft. n. of s. of Columbia to 16 ft. n. of s. of Adelaide.	10	"
" crossing Adelaide, n. side.	6	"
" n. line of Adelaide to Watson.	4	"
" Watson to Harper.	10	"
" Harper to s. line of Boulevard.	6	"
" crossing Boulevard, s. side.	10	"
" 47 ft. e. of n. of Boulevard to Custer.	6	"
Beaufait ave., n. from Jefferson, 585 ft.	0	"
" 585 ft. n. of Jefferson to 235 ft. s. of Champlain.	4	"
" 235 ft. s. of Champlain to 263 ft. n. of Kercheval.	6	"
" s. line of Mack to 190 ft. n. of n. of Forest.	6	"

LOCATION.	DIAM. INCHES.	KIND.
Beaufait ave., crossing N. Boulevard.....	6	iron.
Beaver st., Vinewood to Twenty-seventh.....	4	"
Beech st., Seventh to First.....	4	"
Bellevue ave., Jefferson to 281 ft. n. of n. of Stuart.....	6	"
" crossing Gratiot.....	6	"
" Gratiot to 30 ft. s. of n. of Farnsworth.....	4	"
" crossing N. Boulevard.....	8	"
Belmont ave., 16-in. main to e. line of Woodward.....	6	"
" 99 ft. w. of w. to Oakland.....	6	"
Belvidere ave., crossing Jefferson, n. side.....	10	"
" n. from Jefferson to 283 ft. n. of n. line.....	6	"
" 30 ft. s. of n. of St. Paul to 63 ft. n. of n. of Kercheval....	6	"
" 67 ft. s. of, to 535 ft. n. of Lorman.....	6	"
" crossing Mack on s. side.....	6	"
Benton st., Brush to 8 ft. w. of e. line of Beaubien.....	8	"
" Beaubien to Russell.....	4	"
Berlin st., Gratiot to Jos. Campau.....	3	"
" crossing Jos. Campau.....	4	"
" Jos. Campau to alley w. of McDougall.....	6	"
" alley e. of McDougall to Elmwood.....	3	"
" crossing Elmwood.....	4	"
" Ellery to Mt. Elliott.....	4	"
Bethune ave., Hamilton Boulevard to Woodward.....	6	"
Biddle st., Vinewood to Twenty-seventh.....	4	"
Blaine ave., 16-in. main to w. line of Woodward.....	6	"
" w. from Woodward 1,616 ft.	4	"
Boone st., crossing E. Boulevard, e. side 31 ft.	6	"
" 314 ft. w. of Collins to w. line of same.....	4	"
" crossing Collins.....	6	"
" 284 ft. w. of, to Moran.....	4	"
Boulevard, between Fort and Myrtle, see West Boulevard.		
" " Twenty-seventh and Hubbard, see Myrtle Boulevard.		
" " Myrtle and North Boulevard, see Hubbard Boulevard.		
" " Hubbard Boulevard and McDougall, see North Boulevard.		
" " North Boulevard and Hendrie, see McDougall Boulevard.		
" " McDougall and Frontenac, see Hendrie Boulevard.		
" " Hendrie and Jefferson, see Frontenac Boulevard.		
Bowen ave., Jefferson to 50 ft. s. of Chapaton.....	6	"
Bradley st., w. from Crane 211 ft.	4	"
Brady st., Woodward to 3 ft. w. of w. of Brush.....	6	"
" 3 ft. w. of w. to 18 ft. w. of e. of Beaubien.....	8	"
" Beaubien to Russell.....	4	"
Brainerd st., Trumbull to e. line of Seventh.....	6	"
" e. line of Seventh to Sixth.....	4	"
" Greenwood to alley w. of Fourth.....	3	"
" alley w. of, to 16 ft. w. of e. of Fourth.....	4	"
" 16 ft. w. of e. of Fourth to 17 ft. e. of w. of Third ..	6	"
" Third to Cass.....	4	"
Brandon pl., 114 ft. w. of w. of to Moran.....	6	"
Brandon ave. (west), Campbell to Junction.....	6	"
" Junction to Hubbard.....	4	"
Bratshaw st., 15 ft. w. of e. of Fourth to 26 ft. e. of w. of Third.....	10	"
Breckenridge st., w. from Humboldt 74 ft.	4	"
" Humboldt to Eighteenth.....	6	"
" Eighteenth to 143 ft. w. of Sixteenth.....	4	"
" 144 ft. w. of Sixteenth to Sixteenth.....	6	"
" Fifteenth to 140 ft. w. of Fourteenth.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Breckenridge st., 140 ft. w. of the Fourteenth.....	4	iron.
Brerort pl., Twenty-second to alley e. of.....	6	"
" Nineteenth to alley w. of Eighteenth.....	4	"
Brewster st., crossing e. side of Brush.....	6	"
" e. line of Brush to Russell.....	4	"
" Biopelle to Gratiot.....	4	"
Brinket st., Crane to Hibbard.....	6	"
Bristol pk., Twenty-second to Twenty-first.....	4	"
Bruce st., 2 ft. w. of alley w. of to Crane.....	4	"
Brush st., Atwater to Jefferson.....	6	"
" crossing Jefferson.....	8	"
" Jefferson to Congress.....	4	"
" Congress to Gratiot.....	8	"
" Gratiot to 38 ft. n. of s. of Madison.....	4	"
" Madison to 10 ft. s. of n. of Elizabeth.....	8	"
" Elizabeth to s. line of Adelaide.....	4	"
" crossing s. side Adelaide.....	6	"
" 15 ft. n. of s. of Adelaide to 21 ft. s. of n. of Edmund.....	10	"
" Edmund to Watson.....	24	"
" Watson to Benton.....	6	"
" 15 ft. n. of s. of Benton to 38 ft. s. of n. of Rowena.....	8	"
" Brady to 3 ft. n. of s. of Alexandrine.....	8	"
" 3 ft. n. of s. Alexandrine to 240 ft. n. of Milwaukee.....	6	"
" 230 ft. n. of Milwaukee to 24-in. main in N. Boulevard.....	8	"
" crossing Palmer, both sides.....	4	"
" Horton to Hamlin.....	4	"
" crossing Chandler.....	6	"
Bryant st., e. from Wabash 135 ft.....	6	"
" 135 ft. e. of Wabash to Twelfth.....	4	"
Buchanan st., Livernois to Vinewood.....	16	"
" Vinewood to Grand River.....	30	"
" Twenty-eighth to Scotten.....	4	"
" Twenty-fourth to Twenty-third.....	4	"
" Williams to e. line of Maybury.....	4	"
" e. line of Maybury to 75 ft. e. of Sullivan.....	3	"
" 387 ft. w. of Humboldt to Eighteenth.....	4	"
" 169 ft. w. of, to Seventeenth.....	4	"
" Fifteenth to Wabash.....	4	"
" alley s. of, Joe to Howell.....	6	"
Bunclark court, alley w. of Avery to Twelfth.....	6	"
Burlage pl., Waterloo to Cleveland.....	8	"
Bushy st., Michigan to 21 ft. n. of s. of Julia.....	6	"
Butternut st., Twenty-fourth to Fifteenth.....	21	"
" Williams to 227 ft. e. of Maybury.....	4	"
" e. from Seventeenth 144 ft.....	4	"
" e. from Wabash 263 ft.....	4	"
" National to alley w. of Trumbull.....	4	"
" alley e. of Trumbull to Seventh.....	4	"
Cst., Hubbard to Vinewood.....	4	"
Cadillac ave., Pumping Works to Mack.....	42	"
" crossing Jefferson to n. line.....	6	"
" 1,000 ft. n. of to 2,050 ft. n. of Jefferson.....	6	"
" 95 ft. s. of to Harper.....	6	"
Cadillac square, s. side, Woodward to Randolph.....	24	"
" n. side, Monroe to Bates.....	6	"
" alley n. of, from second alley e. of Woodward to Randolph.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Cadillac square, alley s. of, alley e. of Woodward to Bates.....	4	iron.
Calumet ave., w. line of Twelfth to 196 ft. e. of same.....	4	"
" crossing Lincoln.....	4	"
" Eighth to Fourth.....	4	"
" Grand River to Third.....	30	"
Calvert ave., crossing Woodward to w. line.....	6	"
Cameron ave., 24-in. main to 183 ft. n. of N. Boulevard.....	6	"
" 183 ft. n. of N. Boulevard to Clay.....	4	"
" Clay to 23 ft. n. of Koch.....	6	"
Campau st., River to Fort.....	6	"
" n. from Dix 448 ft.....	4	"
Campbell ave., River to Dunn.....	6	"
" Michigan to 161 ft. n. of Herbert.....	6	"
Canfield ave., Thirteenth to 48 ft. e. of same.....	4	"
" 48 ft. e. of Thirteenth to Twelfth.....	3	"
" crossing Seventh.....	4	"
" e. line of Seventh to Sixth.....	3	"
" Greenwood to Fourth.....	4	"
" Third to Woodward.....	4	"
" Third to Woodward.....	30	"
" Woodward to Collins.....	62	"
" Woodward to 767 ft. w. of Mt. Elliott.....	6	"
" 767 ft. w. of to Mt. Elliott.....	4	"
" Canton to 9 ft. w. of Helen.....	6	"
" alley s. of, from Hastings to alley e. of same.....	3	"
Caniff ave., 16-in. main to w. line of Woodward.....	6	"
" w. of w. line of Woodward 27 ft.....	4	"
Canton ave., Jefferson to 310 ft. n. of Kercheval.....	6	"
" crossing Mack.....	6	"
" 23 ft. s. of n. of Stuart to Gratiot.....	6	"
" Hancock to 168 ft. n. of Frederick.....	6	"
" Medbury to Piquette.....	6	"
" crossing N. Boulevard.....	6	"
Caroline st., Thirteenth to 192 ft. w. of Twelfth.....	6	"
" 192 ft. w. of to Twelfth.....	3 & 4	"
Cass st., Woodbridge to Jefferson.....	8	"
" Jefferson to Fort.....	34	"
" alley n. of Michigan to Spencer.....	4	"
" alley w. of, from alley s. of Spencer to Lewis.....	4	"
Cass ave., Jefferson to Columbia.....	10	"
" Columbia to Gilman.....	16	"
" Gilman to Joy.....	10	"
" Joy to Alexandrine.....	5	"
" Alexandrine to 16 ft. s. of s. line of Canfield.....	6	"
" crossing Canfield 48 ft.....	8	"
" 22 ft. n. of s. of Canfield to 19 ft. n. of n. of Warren.....	6	"
" 19 ft. n. of Warren to 34 ft. n. of s. of Kirby (east).....	10	"
" from Kirby (east) to Kirby (west).....	12	"
" 31 ft. n. of s. of Kirby (west) to 30 ft. n. of s. of Holden.....	10	"
" 30 ft. n. of s. of Holden to 118 ft. s. of D. & B. C. R. R.....	6	"
" 118 ft. s. of D. & B. C. R. R. to Milwaukee.....	6	"
" s. line of N. Boulevard to 24-in. main.....	6	"
" west side, crossing Forest and Putnam.....	4	"
" alley w. of, alley s. of Elizabeth to 119 ft. s. of Gilman.....	4	"
" alley w. of, 119 ft. s. of to Gilman.....	3	"
" alley w. of, Ledyard to Baggs.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Catherine st., Gratiot to Hastings.....	12	iron.
" Hastings to Rivard.....	4	"
" crossing Rivard.....	6	"
" Rivard to w. line of Dequindre.....	4	"
" w. line of Dequindre to e. line of St. Aubin.....	6	"
" e. line of St. Aubin to Elmwood.....	4	"
Cavalry ave., Lafayette to Amherst.....	6	"
" Regular to n. line of Dix.....	6	"
" n. line of Dix to Toledo.....	4	"
Celeron st., 274 ft. w. of Campbell to Junction.....	4	"
Celia st., Wabash to 4 ft. e. of e. line of same.....	4	"
" 4 ft. e. of e. of Wabash to Thirteenth.....	3	"
" Thirteenth to Twelfth.....	4	"
Champlain st., Randolph to St. Aubin.....	30	"
" Randolph to alley e. of same.....	4	"
" St. Antoine to Orleans.....	4	"
" Orleans to Elmwood.....	6	"
" Elmwood to 250 ft. w. of Leib st.....	4	"
" 250 ft. w. of to Leib.....	3	"
" Leib to 50 ft. e. of w. of Frontenac Boulevard.....	4	"
" crossing Frontenac Boulevard roadway 50 ft.....	6	"
" 50 ft. w. of e. of Frontenac Boulevard to Field.....	4	"
" Field to e. line of Baldwin.....	6	"
" Seyburn to Shipherd.....	6	"
" alley s. of, alley e. of Randolph to St. Antoine.....	4	"
Chandler ave., Woodward to Oakland.....	6	"
Charles st., Seventh to Sixth.....	4	"
Charlevoix st., Chene to e. line of Joa. Campau.....	4	"
" e. line of Joa. Campau to alley w. of McDougall.....	3	"
" alley e. of McDougall to Elmwood.....	4	"
" Ellery to Mt. Elliott.....	4	"
" 142 ft. w. of to Concord.....	4	"
Charlotte ave., Fifth to 131 ft. w. of Fourth.....	4	"
" 131 ft. w. of to Fourth.....	3	"
" alley e. of Third to Woodward.....	4	"
Chase st., crossing Russell, e. side.....	4	"
" e. line of Russell to w. line of Riopelle.....	3	"
" crossing w. side of Riopelle.....	4	"
Chene st., Atwater to s. line of N. Boulevard.....	6	"
" Congress to Canfield.....	30	"
Cherry st., Twelfth to Harrison.....	4	"
" National to alley w. of Trumbull.....	3	"
" alley w. of Trumbull to Seventh.....	4	"
" Seventh to Grand River.....	16	"
Chestnut st., Russell to Elmwood.....	4	"
Chipman st., Nineteenth to alley w. of Eighteenth.....	4	"
Chicago Boulevard, crossing Woodward from 16-inch main to e. line.....	6	"
Chope pl., Twenty-fourth to 167 ft. w. of Grand River.....	6	"
" 167 ft. w. of, to Grand River.....	4	"
Christianity st., Morrell to Ferdinand.....	6	"
" Ferdinand to 122 ft. e. of e. of same.....	4	"
" 122 ft. e. of e. of Ferdinand to Lansing.....	6	"
" Lansing to 134 ft. e. of e. of same.....	4	"
" 134 ft. e. of e. of Lansing to McKinstry.....	6	"
Church st., crossing Eleventh st.....	4	"
" 79 ft. w. of w. of Tenth to e. line of same.....	4	"
" alley s. of, Tenth to Eighth.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Clairmont ave., 173 ft. w. of to Hamilton Boulevard.....	6	iron.
" 1,275 ft. w. of w. of Woodward to w. line of same.....	4	"
" w. line to 16-in. main in Woodward.....	6	"
Clark ave., River to s. line of M. C. R. R.	8	"
" s. line of M. C. R. R. to Michigan ave.....	6	"
" Michigan Peninsular Car Works to Michigan ave.....	4	"
" 20 ft. n. of s. of Rich (east) to 26 ft. n. of s. of Rich (west), 78 ft	6	"
Clark park, 293 ft. w. of to Scotten.....	4	"
" e. from Clark 292 ft.....	4	"
" n. and s. from 4-inch pipe 607 ft.....	2	"
Clay ave., 16-in. to 8-in. in Woodward.....	8	"
" Woodward to Oakland.....	8	"
" Oakland to 293 ft. e. of St. Aubin.....	6	"
Cleveland st., St. Aubin to Elmwood.....	10	"
" Elmwood to Burlage pl.....	8	"
Cleveland pl., crossing Greenwood, e side.....	4	"
" e. from Greenwood 264 ft.....	2	"
Clifford st., Sproat to Park pl.....	4	"
" alley w. of Griswold to e. line of Washington.....	4	"
" Washington to Woodward.....	12	"
Clinton st., Gratiot to Rivard.....	10	"
" Rivard to Orleans.....	16	"
" Orleans to Elmwood.....	8	"
" alley s. of, alley w. of Brush to St. Antoine.....	4	"
Clippert st., n. from Dennis 481 ft.....	4	"
Coe ave., Van Dyke to Parker.....	6	"
Colby ave., crossing Russell (e. side).....	4	"
Collins st., Gratiot to Canfield.....	62	"
" Canfield to Griffin.....	20	"
" Leland to Canfield.....	4	"
" n. from Canfield 563 ft.....	2	"
" 563 ft. n. of Canfield to 26 ft. n. of Hancock.....	4	"
" s. from Harper 150 ft.....	6	"
Columbia st., Cass to Park.....	16	"
" Park to Woodward.....	4	"
" Woodward to Rivard.....	6	"
" alley s. of, Cass to Woodward.....	6	"
Columbus ave., s. from Fort 570 ft.....	2	"
" crossing Fort.....	4	"
Commonwealth ave., crossing Grand River.....	6	"
" (w side) Alexandrine to Calumet.....	6	"
" crossing Forest 42 ft.....	12	"
" (both sides), crossing Hancock n. to s. line.....	6	"
" s. line of Putnam to Merrick.....	6	"
" s. line of Kirby to 7 ft. n. of Stanley.....	6	"
" 420 ft. s. of Piquette to Holden.....	6	"
Concord ave., Jefferson to Mack.....	6	"
" Sylvester to s. line of Harper.....	6	"
Congress st., Sixth to Bates.....	20	"
" Randolph to St. Aubin.....	24	"
" St. Aubin to Meldrum.....	12	"
" Bates to Brush.....	4	"
" St. Antoine to Mt. Elliott (e. line).....	4	"
" 171 ft. w. of to Helen.....	4	"
" e. side of Frontenac Boulevard to Field.....	4	"
" alley s. of, Seventh to Sixth.....	4	"
" alley s. of, Fourth to 250 ft. e. of same.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Congress st., alley s. of, Third to Griswold.....	4	iron.
" alley s. of, 80 ft. w. of Brush to St. Antoine.....	4	"
Conger st., 27 ft. w. of e. of Van Dyke to 168 ft. w. of w. of same.....	6	"
Cook st., e. from Welch 239 ft.....	4	"
" 239 ft. e. of Welch to Hammond.....	6	"
Cracow pl., alley e. of Hastings to Rivard.....	6	"
Craig ave., n. from Trombly 378 ft.....	3	"
" 378 ft. n. of Trombly to Milwaukee.....	6	"
Crane ave., Jefferson to Mack.....	8	"
Crary st., 211 ft. w. of to Crane.....	4	"
Crystal st., Trombly to Milwaukee.....	4	"
Custer ave., e. from Woodward 298 ft.....	4	"
" 298 ft. e. of Woodward to John R.....	6	"
" John R. to 307 ft. e. of same.....	4	"
" 307 ft. e. of John R to Brush.....	6	"
" Brush to Hastings.....	4	"
" Rivard to 136 ft. e. of same.....	4	"
" 126 ft. e. of Rivard to Russell.....	6	"
Cutler st., e. from McClellan 450 ft.....	4	"
D st., 300 ft. w. of to Vinewood.....	4	"
Dalselle st., Twenty-fourth to Twenty-third.....	4	"
" Twenty-third to Twenty-second.....	6	"
" Twenty-second to Foundry.....	4	"
" Thirteenth to Twelfth.....	3	"
" crossing Twelfth.....	4	"
Dane st., crossing Collins e. side.....	6	"
" e. line of Collins to 338 ft. e. of Moran.....	4	"
" crossing Mt. Elliott from w. to e. line.....	6	"
Davenport st., Cass to Woodward.....	4	"
Davis pl., Theodore to alley s. of same.....	4	"
Delaware ave., 300 ft. w. of w. line of Second ave., to 44 ft. w. of e. of Woodward.....	6	"
Deming st., e. from Scotten 368 ft.....	4	"
Dennis st., Clippert to Livernols.....	4	"
Dequindre st., Woodbridge to Jefferson.....	6	"
" w. side Jay to Waterloo.....	4	"
" e. side Waterloo to Gratiot.....	4	"
" s. from Adelaide 306 ft.....	4	"
" Alfred to Pierce.....	4	"
" Canfield to Willis.....	4	"
" alley e. of, s. from 266 ft.....	4	"
Detloff court, crossing Hancock, n. side.....	4	"
" Hancock to 270 ft. n. of n. of same.....	3	"
Devereaux st., Thirty-first to Thirtieth.....	6	"
Dillon ave., n. from Holden 687 ft.....	6	"
Division st., crossing Brush, e. side.....	6	"
" e. line of Brush to St. Aubin.....	4	"
Dix ave., Artillery to Twenty-fourth.....	10	"
" (n. side), crossing W. Boulevard 130 ft.....	6	"
" crossing Twenty-third.....	6	"
Dragoon ave., n. from River st. 563 ft.....	6	"
" Hussar to n. line of Dix.....	6	"
Driggs ave., Campbell crossing w. side.....	6	"
" Campbell to Junction.....	4	"
Dry Dock st., Swain to Lady's lane.....	4	"
Dubois st., Atwater to Clinton.....	6	"
" Clinton to Hunt.....	8	"

LOCATION.	DIAM. INCHES.	KIND.
Dubois st., Hunt to n. line of Leland	6	from.
" n. line of Leland to s. line of Canfield.....	3	"
" Canfield, crossing s. side 40 ft.....	6	"
" 40 ft. n. of s. of Canfield to 35 ft. n. of s. of Farnsworth.	16	"
" Farnsworth crossing n. side from 16-in main to n. line 48 ft.	8	"
" n. line of Farnsworth to 188 ft. n. of Frederick.....	4	"
" 188 ft. n. of Frederick to Ferry.....	6	"
" Ferry to Hendrie.....	4	"
" Hendrie to 100 ft. s. of Medbury.....	6	"
" 100 ft. s. of Medbury to 30 ft. s. of Harper.....	4	"
" 30 ft. s. of Harper to 23 ft. n. of s. of Trombly.....	8	"
" crossing N. Boulevard.....	6	"
Duffield st., Cass to Woodward.....	4	"
Dumontier st., e. from Crane 397 ft.	4	"
" 397 ft. e. of to 336 ft. e. of Crane.	6	"
Dunn st., Wesson to Campbell.....	3	"
Durand st., 30 ft. w. of e. of Van Dyke to 373 ft. w. of w. of same.....	6	"
E st., Hubbard to Vinewood.....	4	"
" crossing W. Boulevard from 5 ft. e. of w. to 2 ft. w. of e.	6	"
" e. line of W. Boulevard to Twenty-sixth.....	4	"
" Twenty-sixth to Twenty-fifth.	6	"
Edison ave., 16-inch main in Woodward to w. line of same.....	6	"
Edmund pl., Woodward to Brush.	24	"
Eighth st., River st. to Michigan.....	8	"
" Michigan to Cherry.....	4	"
" Grand River to Calumet.....	8	"
" crossing s. side of Calumet 40 ft.....	6	"
" Calumet to Lyander.....	4	"
Eighteenth st., Fort to s. line of Myrtle.....	6	"
" s. to n. line of Myrtle.	8	"
" Myrtle to 50 ft. n. of Linden.....	6	"
" 50 ft. n. of, to 370 ft. n. of Linden.....	3	"
" 370 ft. n. of, to 493 ft. n. of Linden.....	4	"
" 493 ft. n. of Linden to n. line of Buchanan.....	6	"
" n. line of Buchanan to s. line of Hancock.....	4	"
" crossing s. side of Hancock.....	6	"
" Grand River to N. Boulevard (s. line).....	6	"
" crossing N. Boulevard.....	8	"
" n. from N. Boulevard 236 ft.....	6	"
" alley w. of, Brevoort to Webster pl.....	4	"
" alley w. of, St. Clair to Wing pl.	4	"
" alley w. of, Chipman to Johnson.....	4	"
Eighteenth-and-a-half st., s. from River 504 ft.	3	"
" River to Fort st.....	4	"
Eleventh st., Leverette to Michigan.....	6	"
Elliot st., Woodward to 30 ft. w. of e. of John R.....	6	"
" John R. to Riopelle.....	4	"
Ellery st., Waterloo to Charlevoix.....	6	"
" Aradt to Berlin.....	6	"
" Heidelberg to Schneider pl.....	6	"
" s. line of Mack to Pulford.....	6	"
" Zender to Gratiot.....	6	"
" crossing Hendrie Boulevard.....	6	"
Ellery pl., Forest to Hancock.....	3	"
Elizabeth st., Grand River to Cass.....	5	"
" 23 ft. e. of w. of Park to 30 ft. e. of w. of Brush.....	8	"
" Brush to Beaubien.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Elizabeth st., (both sides), alley e. of Woodward to 177 ft. w. of w. of Brush	4	iron.
" Beaubien to St. Antoine	12	"
" St. Antoine to Hastings	4	"
" alley s. of, 100 ft. w. of Cass to Woodward.	4	"
" alley s. of, alley e. of Woodward to Witherell.	3	"
" alley s. of, John R. to Randolph	4	"
Elm st., alley e. of Wabash to Harrison	4	"
" Harrison to National	6	"
" National to alley w. of Trumbull	4	"
" alley e. of Trumbull to Seventh	4	"
Elmwood ave., Jefferson to Monroe	4	"
" Monroe to Maple	6	"
" Waterloo to Hunt	4	"
" Hunt to Gratiot	6	"
Emmons st., McClellan to Pennsylvania	4	"
Endicott ave., crossing e. side of Woodward	4	"
" crossing w. side of John R.	6	"
Englewood ave., crossing Woodward e. side	6	"
" e. line of Woodward to w. line of Oakland	4	"
" e. from w. line of Oakland 30 ft.	6	"
Erie pl., crossing w. side of Moran 23 ft.	6	"
Erskine st., Woodward to Russell	4	"
" Russell to 159 ft. w. of Riopelle	6	"
" 159 ft. w. of to Riopelle	4	"
" Dequindre to w. line of Chene	4	"
" w. line of Chene to Grandy	8	"
Euclid ave., 530 ft. w. of to Woodward	6	"
Exposition Grounds, s. from River st. 948 ft.	4	"
F st., 140 ft. w. of to Vinewood	4	"
" crossing roadway of Vinewood 27 ft.	6	"
Fairbanks st., e. from Scotten 364 ft.	4	"
Farmer st., Bates to Gratiot	6	"
" 15 ft. s. of to 36 ft. n. of 30-in. main in Gratiot	8	"
Farnsworth st., Woodward to Rivard	6	"
" Rivard to Dubois	18	"
" crossing e. side of Dubois	6	"
" e. line of Dubois to Grandy	4	"
" Mitchell to McDougall	4	"
" crossing Collins	6	"
" Collins to Moran	8 & 4	"
" crossing e. side of Moran 29 ft.	6	"
" crossing Mt. Elliott from w. line to 14 ft. w. of e. 51 ft.	6	"
" 162 ft. w. of to Concord	6	"
" Canton to Helen	4	"
" crossing Frontenac Boulevard	6	"
" alley s. of, or first st. s. of, crossing w. side of Moran	6	"
Farrand st., e. from McClellan 513 ft.	6	"
Ferdinand st., n. from River 975 ft.	4	"
" 975 ft. n. of River to 493 ft. s. of s. line of Fort	6	"
" 493 ft. s. of s. of to Fort	4	"
" Porter to 140 ft. n. of Christianity	6	"
" 360 ft. s. of to 309 ft. n. of Dix	6	"
Ferry ave., Woodward to Russell	4	"
" Russell to St. Aubin	8	"
" St. Aubin to Mitchell	4	"
" 60 ft. w. of w. of Collins to w. line of same	6	"
" w. line of Collins to 82 ft. e. of e. of same	8	"

LOCATION.	DIAM. INCHES.	KIND.
Ferry ave., 247 ft. w. of to Moran	4	iron.
" crossing e. side of Moran	6	"
" crossing Mt. Elliott, from main to main, 30 ft.	6	"
" 24 ft. e. of w. of to 222 ft. e. of e. of Helen	6	"
" crossing Frontenac Boulevard	6	"
" Townsend to Baldwin	6	"
" alley s. of, 168 ft. w. of to Secor pl.	4	"
Field ave., Jefferson to 740 ft. n. of Waterloo	6	"
" 4 ft. s. of Mack to 177 ft. n. of Medbury	6	"
Fifth st., Congress to alley n. of	6	"
" alley s. of to alley n. of Lafayette	4	"
" Abbott to Cherry	6	"
" Cherry to Noble	4	"
" both sides of Crawford Park	4	"
" Holden to 144 ft. s. of Piquette	4	"
" 144 ft. s. of to Piquette	6	"
Fifteenth st., Fort to n. line of Grand River	6	"
" Bagg to Buchanan	24	"
" n. from Warren 245 ft.	6	"
" Kirby to Harper	6	"
" crossing N. Boulevard	6	"
Finley st., 432 ft. w. of to Jos. Campau	4	"
First st., Front to Woodbridge	6	"
" Woodbridge to alley n. of Jefferson	8	"
" Jefferson to s. line of Congress	4	"
" crossing Congress	8	"
" n. line of Congress to Fort	4	"
" Fort to Grand River	6	"
" alley w. of, alley s. of to Spencer	4	"
" alley w. of, alley s. of to Prentiss	4	"
Fischer ave., Jefferson to 90 ft. n. of Beaman	6	"
" crossing Mack from 48-in. to 8-in. main	8	"
" n. from Mack 1,483 ft.	6	"
Florence st., Harper to Piquette	4	"
Florence st., Shipperd to Van Dyke	6	"
Flower st., crossing Forest, s. to n. line	4	"
" n. from Forest 260 ft.	2	"
" 260 ft. n. of Forest to Hancock	6	"
Forest ave., Fourteenth to alley w. of Wabash	6	"
" 2 ft. w. of w. of Wabash to 190 ft. w. of Twelfth	6	"
" 190 ft. w. of Twelfth to Avery	4	"
" Avery to Commonwealth	6	"
" Commonwealth to Trumbull	6	"
" crossing Trumbull	4	"
" Lincoln to Seventh	6	"
" Seventh to Fourth	4	"
" Third to Cass, both sides	4	"
" Cass to 373 ft. w. of Rivard	4	"
" 373 ft. w. of to Rivard	6	"
" Russell to w. line of Dubois	4	"
" crossing Dubois from e. to w.	6	"
" e. line of Dubois to 190 ft. w. of Grandy	4	"
" 190 ft. w. of Grandy to e. line of same	6	"
" McDougall to e. line of Collins	6	"
" e. line of Collins to Moran	4	"
" Moran to 137 ft. w. of Beaufait	6	"
" 137 ft. w. of to Beaufait	4	"

LOCATION.	DIAM. INCHES.	KIND.
Forest ave., e. from Baldwin 164 ft.....	4	iron.
" alley s. of, St. Antoine to 374 ft. w. of Hastings.....	6	"
" alley s. of, 374 ft. w. of to Hastings.....	4	"
Forsyth ave., Baltimore to alley s. of same.....	6	"
Fort st., w. line of Artillery to Twenty-fourth.....	8	"
" Twenty-fourth to Hoffman.....	6	"
" Hoffman to Fourteenth.....	8	"
" Fourteenth to Tenth.....	6	"
" Tenth to Seventh.....	12	"
" Seventh to Woodward.....	16	"
" Griswold to Woodward.....	4	"
" St. Antoine to Meldrum.....	4	"
" 168 ft. w. of to Helen.....	4	"
" alley s. of, Eighth to Seventh.....	4	"
" alley s. of, Seventh to Fifth.....	8	"
" alley s. of, 10 ft. w. of Third to Cass.....	4	"
" alley s. of, Cass to Shelby.....	6	"
" alley s. of, Shelby to alley w. of Woodward.....	4	"
Foundry st., Baker to Michigan.....	6	"
Fourth st., Woodbridge to Larned.....	4	"
" Larned to Congress.....	8	"
" Port to Grand River.....	6	"
" alley w. of, Labrosse to alley s. of Michigan.....	4	"
Fourth ave., Grand River to Bagg.....	4	"
" Bagg to Calumet.....	6	"
" Calumet to s. line of Kirby.....	4	"
" s. to n. line of Kirby.....	6	"
" n. line of Kirby to 21 ft. s. of n. of Bratahaw.....	4	"
" 21 ft. s. of n. of Bratahaw to 13 ft. s. of n. of Holden.....	10	"
" alley w. of, Brainard to alley n. of.....	4	"
" alley w. of, Selden to alley s. of.....	4	"
" alley w. of, Lysander to Prentiss.....	3	"
Fourteenth ave., Fort to Lafayette.....	8	"
" Lafayette to Bagg.....	10	"
" Bagg to Grand River.....	8	"
" Grand River to s. line of N. Boulevard.....	6	"
" s. to n. line of N. Boulevard.....	8	"
" (w. side), n. from Porter 402 ft.....	4	"
Fox st., Frank to Alexandrine.....	3 & 4	"
Frank st., Seventh to 23 ft. e. of w. of Sixth st.....	6	"
" Sixth to Fourth.....	4	"
Franklin st., Randolph to Beaubien.....	4	"
" Beaubien to Orleans.....	6	"
" Orleans to 25 ft. e. of Dequindre.....	4	"
" 25 ft. e. of Dequindre to McDougall.....	6	"
" Walker to Adair.....	4	"
" 325 ft. w. of to Leib st.....	4	"
" alley s. of, McDougall to Walker.....	4	"
Frederick st., Woodward to 124 ft. e. of Riopelle.....	4	"
" 124 ft. e. of Riopelle to 139 ft. e. of same.....	6	"
" 352 ft. w. of St. Aubin to Jos. Campau.....	4	"
" Collins to 125 ft. e. of Moran.....	6	"
" Helen to 69 ft. w. of w. of Frontenac Boulevard.....	4	"
" connecting two mains in Mt. Elliott ave.....	6	"
Fremont pl., Collins to 443 ft. w. of Moran.....	6	"
" 443 ft. w. of to Moran.....	4	"
Front st., Third to 167 ft. e. of same.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Front st., Second to 170 ft. e. of First.....	4	iron.
Frontenac Boulevard, (w. side), s. from 48-in. main in Jefferson to B. I. Park	10	"
" (w. side), crossing Jefferson ave. from main to n. line.....	6	"
" (w. side), main in Mack to n. line.....	4	"
" (w. side), s. to n. line of Gratiot.	6	"
" (w. side), crossing Farnsworth, Ferry & Hendrie,	5	"
(e. side), 434 ft. s. of to 330 ft. s. of Jefferson	8	"
" (e. side), 330 ft. s. of Jefferson to 30 ft. s. of n. of St. Paul.....	6	"
" (e. side), s. of Mack, crossing Boulevard 76 ft.	6	"
" (e. side), Mack, 23 ft. s. of n. to s. line.....	6	"
" (e. side), 4-in. main to 18 ft. n. of s. line.....	4	"
" (e. side), 30 ft. s. of s. of Gratiot to Gratiot.....	4	"
" (e. side), n. from Gratiot 63 ft.....	6	"
" (e. side), crossing Farnsworth and Hendrie Boulevard.....	6	"
" crossing Frontenac Boulevard 434 ft. s. of and 330 ft. s. of.....	3	"
Frontenac ave., s. from Medbury 96 ft.	6	"
Galster st., Canfield to Forest.....	6	"
Garfield ave., Woodward to 357 ft. e. of e. of John R.	4	"
" 357 ft. e. of e. of John R. to 10 ft. w. of Brush.....	6	"
" 10 ft. w. of Brush to e. line of Brush.....	4	"
" e. line of Brush to 223 ft. w. of Beaubien.	6	"
" 223 ft. w. of Beaubien to e. line of St. Antoine	4	"
" e. line of St. Antoine to 346 ft. w. of Hastings	6	"
" 346 ft. w. of to Hastings	3	"
" Hastings to w. line of Dubois.....	4	"
" crossing Dubois w. to e. line.....	6	"
" e. line of Dubois to Chene, w. line.....	4	"
" w. line of Chene to e. line of Grandy.....	6	"
" e. from McDougall 213 ft.....	4	"
" crossing Collins.....	6	"
" 198 ft. w. of Galster to 213 ft. w. of Moran.....	6	"
" 213 ft. w. of to Moran.....	4	"
" crossing Moran, e. side.....	6	"
" crossing Mt. Elliott 53 ft.	6	"
" 183 ft. w. of to Beaufait.....	4	"
" alley s. of, Second to 150 ft. e. of same.....	3	"
" alley s. of, St. Antoine to 374 ft. w. of Hastings.....	6	"
" alley s. of, 374 ft. w. of to Hastings.....	4	"
" alley s. of, Hastings to 335 ft. e. of same.....	3	"
Gilman st., Grand River to Cass	16	"
Gladstone ave., 806 ft. w. of to 16-inch main in Woodward.....	6	"
Glyan ct., 300 ft. w. of to the w. line of Woodward.....	4	"
" w. line of Woodward to 16-inch main	6	"
Goethe st., Orace to Holcomb.....	4	"
" e. from McClellan 238 ft.....	4	"
Goldner ave., Michigan to G. T. R. R.	6	"
Grand River ave., Woodward to Cass	8	"
" Cass to Third	6	"
" Third to 400 ft. w. of Humboldt.	8	"
" 400 ft. w. of Humboldt to Vinewood	6	"
" Vinewood to N. Boulevard	10	"
" N. Boulevard to city limits.....	6	"
" Calumet to Buchanan	30	"

LOCATION.	DIAM. INCHES.	KIND.
Grand River ave., connecting 30-in. with 8-in. in Buchanan, 23 ft.....	8	iron
" (s. side), Second to 56 ft. e. of Cherry.....	4	"
" (n. side), e. from Eighth 110 ft.....	3	"
" alley e. of, 10 ft. n. of Bagley to alley n. of Bagley.....	4	"
" alley e. of, Fourth to Union.....	4	"
" alley e. of, w. from Lincoln 47 ft.....	4	"
" alley e. of, Trumbull to alley w. of same.....	6	"
" alley e. of, Wabash to alley w. of same.....	6	"
Grandy ave., Gratiot to Pierce	8	"
" Pierce to Harper	6	"
" n. from Harper 323 ft	4	"
" 323 ft. n. of Harper to Chene.	6	"
Granger st., e. from Baldwin 359 ft.	6	"
" 259 ft. e. of Baldwin to Van Dyke.	4	"
Grant st., n. from Warren 313 ft	4	"
Grant st., Thirteenth to Twelfth, w. line.	3	"
" crossing w. side of Twelfth.....	4	"
Granville pl., Wabash to e. line of same.....	4	"
" e. line of Wabash to Thirteenth.....	3	"
Gratiot ave., Woodward to Raynor	30	"
" Raynor to w. line of Rivard (s).....	10	"
" w. line of Rivard (s) to St. Aubin.....	12	"
" Woodward to Brush.....	10	"
" Brush to 64 ft. w. of Sheridan.....	6	"
" 64 ft. w. of Sheridan to 266 ft. w. of Harper.....	8	"
" 266 ft. w. of Harper to Cadillac.....	6	"
" alley s. of, alley e. of Woodward to Farmer.....	4	"
" alley s. of, Farmer to alley e. of Farrar.....	6	"
Greenwood ave., Bagg to Calumet.....	6	"
" crossing Calumet	8	"
" n. line of Calumet to N. Boulevard ..	6	"
Griffin st., see North Boulevard.		
Griswold st., Detroit River to Atwater	8	"
" Atwater to State.....	6	"
" 26 ft. n. of n. of Grand River to 16 ft. s. of s. of Clifford.....	8	"
" 16 ft. s. of s. line of Clifford to 12-in. main in Clifford.....	10	"
Grummond ave., Hamilton Boulevard to 16-in. main in Woodward.....	6	"
Guilloy st., Clay to Sidney	6	"
Guoin st., Russell to Orleans.....	4	"
" Orleans to McDougall.....	10	"
" McDougall to Walker.....	6	"
Haigh ave., 16-in. main to e. line of Woodward.....	6	"
" e. line of Woodward to 158 ft. e. of same.....	4	"
" Russell to 365 ft. e. of Greeley.....	6	"
Hale st., Riopelle to St. Aubin	6	"
" e. from St. Aubin 275 ft.....	4	"
" 275 ft. e. of St. Aubin to Dubois.....	3	"
" Dubois to Chene.....	4	"
" Chene to Grandy.....	3	"
" Grandy to Jos. Campau.....	6	"
Hamilton ave., Mack to 692 ft. n. of Canfield.....	6	"
Hamilton Boulevard, crossing N. Boulevard.....	10	"
" n. line of N. Boulevard to 26 ft. s. of s. line of Blaine ..	4	"
" 26 ft. s. of s. of Blaine to Bancroft.....	10	"
Hamlin ave., Woodward to Oakland	4	"
Hammond ave., Toledo to s. line of L. S. & M. S. R. R.....	6	"
" 356 ft. s. of Leavitt to 176 ft. n. of Ranspach	6	"

LOCATION.	DIAM. INCHES.	KIND.
Hammond ave., Poplar to Horatio.....	6	iron.
Hancock ave., Scotten to La Salle.....	4	"
" crossing Hubbard Boulevard 166 ft.....	6	"
" w. line of Vinewood to Twenty-sixth.....	4	"
" Twenty-fifth to e. line of Twenty-fourth.....	4	"
" Twenty-third to 155 ft. e. of e. line of same.....	4	"
" 155 ft. e. of e. of Twenty-third to 20 ft. w. of e. of Williams	6	"
" Eighteenth to Seventeenth.....	4	"
" crossing Fourteenth.....	4	"
" Fourteenth to w. line of Wabash.....	3	"
" w. line of Wabash to 130 ft. w. of Thirteenth.....	6	"
" 130 ft. w. of Thirteenth to Avery.....	4	"
" Avery to Commonwealth.....	6	"
" Commonwealth to Fourth.....	4	"
" s. side, e. from Third 10 ft.....	4	"
" crossing Third.....	6	"
" n. side, e. from Third 461 ft.....	4	"
" n. side, 461 ft. e. of Third to Second.....	6	"
" w. line of Cass to 112 ft. e. of Riopelle.....	4	"
" 498 ft. w. of to St. Aubin.....	6	"
" St. Aubin to w. line of Dubois.....	4	"
" crossing Dubois.....	8	"
" 281 ft. w. of Chene to Grandy.....	4	"
" 31 ft. e. of w. of Jos. Campau to 26 w. of e. of Mitchell ..	6	"
" Mitchell to McDougall.....	4	"
" e. from McDougall 281 ft.	6	"
" crossing Collins.....	6	"
" e. line of Collins to Detloff et.....	4	"
" Detloff et. to alley w. of Ellery pl.....	6	"
" alley w. of Ellery to alley w. of Mt. Elliott.....	4	"
" crossing Mt. Elliott from w. to e. line.....	6	"
" Canton to Helen.....	6	"
" alley s. of, Greenwood to Leroy pl.....	4	"
" alley s. of, alley e. of Riopelle to w. line of Orleans.....	3	"
" alley s. of, crossing w. side of Orleans.....	4	"
Hanover ave., crossing Russell e. side.....	4	"
Harmon ave., 16-in. main to e. line of Woodward.....	6	"
" e. line of Woodward to Oakland.....	4	"
Harper ave., Fifteenth to 184 ft. w. of Fourteenth.....	6	"
" 184 ft. w. of to Fourteenth.....	4	"
" crossing Fourteenth.....	6	"
" 176 ft. w. of to Twelfth.....	4	"
" Woodward to Russell.....	4	"
" Widman pl. to 184 ft. e. of Dubois.....	4	"
" 184 ft. e. of Dubois to w. line of Chene.....	6	"
" w. line of Chene to 26 ft. w. of e. of Mitchell.....	4	"
" 26 ft. w. of e. of Mitchell to w. line of McDougall Boulevard	6	"
" crossing McDougall Boulevard.....	8	"
" crossing Collins.....	8	"
" e. line of Collins to e. line of Mt. Elliott.....	6	"
" Baldwin to 433 ft. e. of Van Dyke.....	6	"
" Rhns to Holcomb.....	6	"
" Gratiot to Cadillac.....	6	"
" alley s. of, John R. to 350 ft. e. of same.....	4	"
" alley s. of, crossing Brush.....	4	"
Harrison ave., crossing Michigan.....	12	"
" Michigan to Grand River.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Harrison ave., alley w. of, Linden s. to Linden n.	4	iron.
Harvey ave., Junction to 500 ft. w. of Campbell.....	4	"
Hastings st., s. line to 16-in. main in Jefferson.	16	"
" Jefferson to Champlain	24	"
" 118 ft. s. of Congress to Fort.....	3	"
" Champlain to Monroe.....	3	"
" Congress to Clinton.....	6	"
" Clinton to s. line of Mullett.....	4	"
" crossing s. side of Mullett.....	8	"
" Mullett to Catherine.....	12	"
" Catherine to Watson.....	6	"
" Watson to Canfield.....	10	"
" Canfield to Theodore.....	8	"
" s. line of Farnsworth to alley s. of Palmer.....	6	"
" s. line of Medbury to Harper.....	8	"
" Harper to Piquette.....	6	"
" Piquette to s. line of Trombly.....	4	"
" s. line of Trombly to s. line of N. Boulevard.....	6	"
" crossing N. Boulevard	8	"
" n. line of N. Boulevard to Custer....	4	"
" Custer to Marston.....	6	"
" first alley e. of, alley s. of to 12 ft. s. of s. line of Canfield... 3	3	"
" first alley e. of, 12 ft. s. of s. to 21 ft. n. of s. line of Canfield 4	4	"
" first alley e. of, first alley s. of Garfield to Oracow pl	6	"
" second alley e. of, second alley s. of Garfield to first alley s. of same.....	6	"
Hazel st., Thirteenth to 96 ft. e. of same.....	4	"
" 96 ft. e. of Thirteenth to 156 ft. w. of Twelfth.....	3	"
" 156 ft. w. of Twelfth to Harrison.....	4	"
Hazelwood ave., e. from 10-in. main in Hamilton Boulevard 28 ft.....	6	"
" 13 ft. w. of e. of Hamilton Boul. to w. line of Woodward 4	4	"
" w. line of Woodward to 16-in. main.....	6	"
Heck pl., crossing n. side of Forest.....	4	"
" Forest to Hancock.....	3	"
Hecla ave., Merrick to 343 ft. n. of Kirby.....	4	"
" 637 ft. s. of s. of Piquette to Milwaukee.....	6	"
Heidelberg st., Jos. Campau to alley e. of same.....	6	"
" alley e. of McDougall to w. line of Elmwood.....	3	"
" crossing Elmwood, w. side, 39 ft.....	4	"
" Elmwood to Mt. Elliott.....	6	"
Helen ave., Jefferson to 91 ft. s. of s. of Macomb.....	6	"
" crossing Mack.....	6	"
" Gratiot to 192 ft. n. of Medbury.....	6	"
Hendricks st., St. Aubin to Dubois.....	3	"
" Dubois to alley w. of McDougall.....	4	"
" alley e. of McDougall to Elmwood.....	4	"
" Elmwood to 522 ft. w. of Mt. Elliott.....	6	"
" 522 ft. w. of to Mt. Elliott.....	4	"
Hendrie ave., Woodward to 550 ft. e. of John R.....	4	"
" 550 ft. e. of John R. to w. line of Brush.....	6	"
" crossing Brush and St. Aubin.....	4	"
" Dubois to 224 ft. e. of same.....	6	"
" 224 ft. e. of Dubois to e. line of Chene.....	4	"
" e. from e. line of Chene 148 ft.....	6	"
" 148 ft. e. of e. of Chene to e. line of Grandy.....	4	"
" e. line of Grandy to e. line of McDougall.....	6	"
Hendrie Boulevard, (both sides), crossing Collins, Ellery, Moran.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Hendrie Boulevard, (both sides), crossing Mt. Elliott, Meldrum, Beaufait	6	iron.
" (both sides), crossing Bellevue, Concord, Canton....	6	"
" (both sides), crossing Helen.....	6	"
" (north side), crossing Frontenac.....	8	"
Hendrie ave., Baldwin to 364 ft. e. of same.....	6	"
" 364 ft. e. of Baldwin to Van Dyke.....	4	"
Henrietta ave., crossing Campbell.....	6	"
Henry st., alley e. of, to Third.....	4	"
" Third to Cass.....	6	"
" Clifford to Woodward.....	4	"
Herbert st., 134 ft. w. of Lovett to Scotten.....	4	"
Hibbard ave., Jefferson to 303 ft. n. of Brinket.....	6	"
High st., National to alley w. of Trumbull.....	3	"
" alley w. of Trumbull to Fourth.....	4	"
" Fourth to w. line of Third.....	3	"
" w. line of, to Third.....	4	"
" Third to Grand River.....	6	"
" Grand River to 26 ft. e. of e. of Woodward.....	4	"
" 37 feet e. of w. of Woodward to 3 ft. w. of e. of John R.....	8	"
" e. line of John R to w. line of Beaubien.....	4	"
" crossing Beaubien, w. to e. line.....	6	"
" e. line of Beaubien to 336 feet ft. e. of e.....	3	"
" 336 ft. e. of Beaubien to Russell.....	4	"
" Russell to Riopelle.....	3	"
Hoffman st., River st. to Fort.....	8	"
Holborne ave., crossing Mt. Elliott, w. side.....	6	"
" e. from Mt. Elliott 170 ft.....	4	"
Holbrook ave., Woodward to 360 ft. e. of e. line of same.....	6	"
Holcomb ave., Jefferson to Louis.....	6	"
" Goethe to Mack.....	6	"
" 374 ft. s. of s. of Gratiot to Harper.....	6	"
Holden ave., Third to Cass.....	10	"
" Cass to Woodward.....	6	"
Holden road, Third to Fourth.....	4	"
" Fourth to N. Boulevard, s. line.....	8	"
" s. line of, to 34-inch main in N. Boulevard.....	10	"
" Lincoln to Greenwood.....	4	"
Homer st., w. from Crane 215 ft.....	4	"
Hooker ave., e. from Grand River 63 ft.....	4	"
" Sullivan to 596 ft. w. of Eighteenth.....	6	"
" 596 ft. w. of, to Eighteenth.....	4	"
Horatio st., Liversois to Welch.....	4	"
" Welch to Howell.....	6	"
" Thirty-third to Thirty-second.....	6	"
" Scotten to La Salle.....	6	"
Horton ave., Woodward to Oakland.....	4	"
Houghton ave., Holcomb to McClellan.....	4	"
Howard st., Campbell to 243 ft. w. of Junction.....	6	"
" 343 ft. w. of, to Junction.....	4	"
" Scotten to alley e. of.....	4	"
" Twenty-fifth to Twenty-fourth.....	4	"
" Twenty-fourth to w. side M. C. R. R. bridge.....	6	"
" Twelfth to Tenth.....	6	"
" alley s. of, Fourteenth to alley e. of same, 190 ft.....	3	"
" " 333 ft. w. of, to Tenth.....	4	"
" " Tenth to First.....	6	"
" " First to Shelby.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Howell st., alley s. of, to n. line of Buchanan.....	6	iron.
n. from Horatio 680 ft.....	6	"
Hubbard ave., Fort to 235 ft. n. of Brandon	6	"
E st. to Michigan.....	4	"
Michigan to Myrtle.....	6	"
Hubbard Boulevard, Myrtle to Visgar.....	6	"
(east side), Buchanan to Hancock.....	6	"
" crossing Warren.....	4	"
" n. line of Warren to n. line of McGraw..	6	"
" Scovel pl. to 161 ft. s. of N. Boulevard..	6	"
" 161 ft. s. of, to N. Boulevard.....	4	"
" (west side), crossing Buchanan.....	6	"
" s. line of Hancock to n. line of McGraw	6	"
" s. from N. Boulevard 117 ft.....	6	"
" (both sides), crossing Scovel, Moore and Wreford..	6	"
Hudson ave., Vinewood to e. line of same.....	6	"
e. line of Vinewood to Twenty-sixth.....	4	"
" Twenty-sixth to 25 ft. e. of w. of Twenty-third.....	6	"
" Twenty-third to Maybury.....	4	"
" Maybury to Grand River.....	6	"
" w. line of Humboldt to 144 ft. w. of Eighteenth.....	4	"
" 144 ft. west of, to Eighteenth.....	6	"
" crossing e. side of Eighteenth.....	4	"
" Fifteenth to Fourteenth.....	6	"
" Seventh to 564 ft. w. of Greenwood.....	6	"
" 564 ft. w. of, to e. line of Greenwood.....	4	"
" crossing w. side of Fourth.....	4	"
Humboldt ave., Michigan to s. line of Butternut.....	4	"
" crossing Butternut.....	6	"
" n. line of Butternut to s. line of Buchanan.....	4	"
" crossing Buchanan.....	6	"
" n. line of Buchanan to D. & B. C. R. R.....	4	"
" s. line of Warren to McGraw.....	6	"
Hunt st., Dubois to alley w. of McDougall.....	4	"
" alley e. of McDougall to Elmwood	4	"
" Ellery to Mt. Elliott.....	4	"
Hurlbut ave., crossing Jefferson to 21 ft. n. of same.....	6	"
" n. from Mack 360 feet.....	6	"
Huron st., s. from Locust 295 ft.....	3	"
" Locust to Bagg.....	6	"
Hussar st., Dragoon to Military.....	6	"
Illinois st., Brush to Russell.....	6	"
" Russell to St. Aubin.....	4	"
" St. Aubin to w. line of Dubois.....	3	"
" crossing Dubois	4	"
" Dubois to Chene w. line	3	"
" crossing Chene.....	4	"
" Chene to w. line of Grandy.....	3	"
" w. line of Grandy to Jos. Campau.....	6	"
" e. from McDougall 241 ft.....	3	"
" 241 ft. e. of to 431 ft. e. of McDougall.....	4	"
" 193 ft. w. of to Moran.....	4	"
Indiana st., Beaubien to Russell.....	8	"
Ingersoll st., e. from Weason 236 ft.....	4	"
Iron st., Wight to Jefferson.....	6	"
Irving st., Seventh to Greenwood.....	4	"
Ivy Place, Twenty-third to Grand River.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Jackson st., Thirty-fifth to Thirty-fourth.....	6	iron.
" Thirtieth to Twenty-ninth.....	6	"
" Twenty ninth to e. line of Scotten.....	4	"
Jay st., Riopelle to 44 ft. w. of McDougall.....	4	"
Jefferson ave., First to Griswold.....	8	"
" Griswold to Orleans.....	10	"
" Dequindre to w. side of Belt Line R. R.....	6	"
" e. side of Belt Line to McClellan.....	6	"
" McClellan to E. City Limits.....	10	"
" e. from E. City Limits to 178 ft. e. of e. of entrance to Driving Park grounds.....	8	"
" 178 ft. e. of e. of Driving Park to 37 ft. w. of e. of Marsh- land Road.....	6	"
" Second to Hastings.....	16	"
" Meldrum to Pumping Works.....	48	"
" alley s. of, Cass to Shelby.....	4	"
" alley s. of, alley w. of Griswold to alley w. of Woodward	4	"
" alley s. of, alley w. of Bates to Randolph.....	4	"
" alley s. of, Brush to Beaubien.....	8	"
" alley s. of, Beaubien to 189 ft. e. of same.....	4	"
Joe st., Michigan to alley s. of Buchanan.....	6	"
John R st., Woodward to Miami.....	12	"
" n. side of Miami to s. side of Madison.....	4	"
" n. side of Madison to Adams.....	4	"
" Columbia to Edmund.....	8	"
" Edmund to s. line of Rowena.....	6	"
" s. line of Rowena to Brady.....	8	"
" Brady to s. line of Canfield.....	6	"
" crossing Canfield.....	8	"
" n. line Canfield to s. line of N. Boulevard.....	6	"
" crossing N. Boulevard, s. side.....	6	"
" Horton to Hamlin.....	6	"
Johnson st., Nineteenth to alley w. of Eighteenth.....	4	"
Jones st., Sixth to 180 ft. w. of Fifth.....	6	"
" 180 ft. w. of Fifth to Cass.....	4	"
Jos. Campau ave., Atwater to Clinton.....	6	"
" Jay to s. line of Gratiot.....	6	"
" s. line of Gratiot to St. Joseph.....	4	"
" St. Joseph to Trombly.....	6	"
" Trombly to 250 ft. n. of Milwaukee.....	4	"
" 250 ft. n. of Milwaukee to s. line of N. Boulevard.....	6	"
" crossing N. Boulevard.....	8	"
" N. Boulevard to 10 ft. n. of Denton (w. side).....	6	"
" alley e. of, Mullett to Jay.....	4	"
" alley e. of, Cleveland to Hendricks.....	3	"
" alley e. of, Hendricks to Hunt.....	4	"
" alley e. of, Hunt to Charlevoix.....	3	"
" alley e. of Charlevoix to Heidelberg.....	4	"
Josephine ave., 16-in. main to e. line of Woodward.....	6	"
Joy st., Fifth to Fourth.....	4	"
" Fourth to alley e. of Third.....	6	"
" alley e. of Third to Cass.....	4	"
Julia st., Weason to Bushey.....	6	"
Junction ave., River to Fort, s. line.....	6	"
" s. line of Fort to Otis.....	8	"
Kanter ave., crossing Collins.....	6	"
" 185 ft. w. of Collins to Moran.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Kanter ave., 166 ft. w. of to Mt. Elliott.....	4	iron.
" crossing e. side McDougall Boulevard.....	6	"
Kercheval ave., Mt. Elliott to Beaufait.....	4	"
" Field to Baldwin	4	"
King ave., 16-in. main to e. line Woodward.	6	"
Kinman st., Twenty-eighth to Scotten.....	4	"
Kirby ave., Vinewood to 247 ft. w. of Twenty-seventh.....	6	"
" 247 ft. w. of to Twenty-seventh	4	"
" crossing Humboldt.....	4	"
" Eighteenth to 87 ft. e. of Sixteenth.....	4	"
" 87 ft. e. of Sixteenth to 126 ft. w. of Fourteenth.....	6	"
" 126 ft. w. of to Fourteenth.....	4	"
" Fourteenth to Wabash.....	6	"
" Thirteenth to 19 ft. e. of w. of Twelfth.....	6	"
" 19 ft. e. of w. of Twelfth to 49 feet e. of w. of Trumbull.....	8	"
" 49 ft. e. of w. of Trumbull to Cass.....	10	"
" 23 ft. w. of e. of Cass to 18 ft. w. of e. of Rivard	16	"
" crossing e. side of Rivard.....	8	"
" e. from Russell 216 ft.....	4	"
" St. Aubin to Chene.....	4	"
" crossing Grandy.....	4	"
" crossing Collins.....	6	"
" w. line Moran to 438 e. of e. of same.....	6	"
" connecting two mains in Mt. Elliott.....	6	"
" Concord to Canton.....	6	"
" e. from Helen 238 ft.....	4	"
" Sheridan to Townsend.....	6	"
" Baldwin to 161 ft. e. of same.....	6	"
" 161 ft. e. of Baldwin to Van Dyke	4	"
Koch. ave., 16-inch main to e. line of Woodward	6	"
" e. line of Woodward to w. line of Oakland	4	"
" crossing w. side of Oakland, 26 ft.....	6	"
Kolb st., Crane ave. to 470 ft. e. of e. of same.....	6	"
Labrosae st., crossing e. side of Twelfth.....	6	"
" e. line of Twelfth to 430 ft. w. of Tenth.....	4	"
" 430 ft. w. of, to Tenth.	3	"
" Fifth to Fourth.....	4	"
" alley s. of, alley e. of Twelfth to Fourth.	4	"
Lady's lane, n. from Dry Dock st. 214 ft.....	4	"
Lafayette ave., Artillery to Dragoon.....	6	"
" Dragoon to 123 ft. e. of same.....	4	"
" 123 ft. e. of Dragoon to 315 ft. w. of Junction	6	"
" 315 ft. w. of, to Junction.....	4	"
" crossing Clark	6	"
" e. from Scotten 256 ft.....	4	"
" 256 ft. e. of, to 352 ft. e. of Scotten.....	6	"
" Twenty-fourth to e. line of Twenty-third.	4	"
" Eighteenth to 110 ft. w. of w. line of Seventeenth.....	6	"
" 110 ft. w. of w. of, to Seventeenth	4	"
" alley w. of Sixteenth to Fifteenth.....	4	"
" Fifteenth to w. line of Fourteenth.....	3	"
" Fourteenth to Twelfth.....	4	"
" crossing Twelfth, e. side.....	6	"
" M. C. R. Bridge to 743 ft. w. of Tenth.....	3	"
" 743 ft. w. of, to Tenth.....	4	"
" Shelby to Griswold	4	"
" alley s. of, Tenth to Fifth.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
LaCrosse ave. alley s. of Fourth to First.....	4	iron
" " First to Wayne.....	6	"
" " Shelby to Griswold.....	6	"
LaForty pl., Howard to s. side M. C. R. R.....	6	"
Lambert pl., crossing w. side of Twenty-third.....	4	"
" " crossing from w. to e. of Twenty-second.....	4	"
" " Twenty-second to Twenty-first.....	6	"
Lambert st., crossing e. side of Mt. Elliott.....	6	"
" " Concord to Canton.....	4	"
" " e. from Baldwin 325 ft.....	6	"
" " 325 ft. e. of Baldwin to Van Dyke.....	4	"
Langley ave., Seventh to 141 ft. e. of e. of same.....	6	"
" " 141 ft. e. of e. of Seventh to Fourth.....	4	"
Lauman st., crossing e. side of Vinewood.....	4	"
" " e. side of Vinewood to Twenty-seventh.....	6	"
Lanning ave., Fort to 159 ft. n. of Christianity.....	6	"
" " 227 ft. s. of Dix to Toledo.....	6	"
Larned st., Fifth to Fourth.....	4	"
" " Fourth to Third.....	6	"
" " alley w. of to Woodward.....	6	"
" " Third to Hastings.....	16	"
" " Bates to Brush.....	4	"
" " St. Antoine to Dequindre.....	4	"
" " Riopelle to St. Aubin.....	12	"
" " St. Aubin to w. line of Elmwood.....	4	"
" " w. line of Elmwood to 748 ft. e. of.....	6	"
" " Left to alley e. of.....	4	"
" " w. line of Mt. Elliott to main 36 ft.....	4	"
" " Mt. Elliott to Meldrum, 25 w. of e.....	6	"
" " w. from Helen 126 ft.....	4	"
" " alley s. of, Third to First.....	6	"
" " alley s. of, First to Griswold.....	4	"
" " alley s. of, Shelby to Griswold.....	6	"
LaSalle ave., Michigan to Horatio.....	6	"
" " Kirby to McGraw.....	6	"
Lauderdale ave., Campbell to 273 ft. w. of w. of Junction.....	6	"
" " 273 ft. w. of to Junction.....	4	"
Laurel st., Wabash to Grand River.....	4	"
Leach st., w. from Crane 215 ft.....	4	"
Leavitt ave., Livernois to Wesson.....	4	"
Levyard st., Third to Cass.....	6	"
Leicester st., 16-in. main to e. line of Woodward.....	6	"
" " e. from Woodward 1,379 ft.....	4	"
Leland st., 2 ft. w. of e. of Brush to Beaubien.....	6	"
" " Beaubien to Russell.....	4	"
" " Russell to McDougall.....	4	"
" " McDougall to Collins.....	2	"
" " 216 ft. w. of Moran to Gratiot.....	4	"
Leroy pl., n. from Forest 251 ft.....	3	"
Lexing st., e. from McClellan 158 ft.....	4	"
Leverette st., Twelfth to Tenth.....	4	"
" " Eighth to Seventh.....	4	"
" " alley s. of, Tenth to Eighth.....	4	"
Lewis st., Fourth to Cass.....	4	"
" " alley s. of, alley e. of Third to Second.....	4	"
Leib st., Wight to Jefferson.....	6	"
" " Jefferson to Champlain.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Leib st., Champlain to Monroe.....	8	iron.
Lincoln ave., crossing Calumet n. side 36 ft.....	8	"
" n. line of Calumet to Holden.....	6	"
" crossing n. side of Holden.....	8	"
" n. line of Holden to Milwaukee.....	6	"
" crossing s. side of N. Boulevard 87 ft.....	6	"
" alley w. of, Plum to Sycamore.....	6	"
" alley w. of, alley n. of Grand River to s. line of Calumet .	4	"
" alley w. of, crossing s. side of Calumet 16 ft.....	6	"
Linden st., 26 ft. e. of Twenty-sixth to Twenty-fifth.....	4	"
" Twenty-fourth to Tillman.....	4	"
" Maybury to 137 ft. e. of e. of Humboldt.....	4	"
" 137 ft. e. of e. of Humboldt to Eighteenth.....	6	"
" Eighteenth to Harrison.....	4	"
Livernois ave., Dix to M. C. R. R.....	8	"
" M. C. R. R. to n. city limits.....	10	"
Locust st., Wabash to Harrison.....	4	"
" National to 30 ft. e. of same.....	4	"
" 30 ft. e. of National to alley w. of Trumbull.....	3	"
" alley e. of Trumbull to Fourth.....	4	"
" Fourth to Grand River.....	6	"
Longfellow ave., 16-in. main to w. line of Woodward .	6	"
Lorman ave., Crane to Belvidere .	4	"
Lothrop ave., Hamilton Boulevard to Woodward.....	6	"
Louis ave., Crane to Holcomb .	4	"
Lovett ave., Michigan to n. line of Buchanan .	6	"
" Rich to 93 ft. n. of n. of Horatio .	4	"
" 93 ft. n. of Horatio to 264 ft. n. of Herbert.....	6	"
" alley w. of, Viagar to Jackson.....	6	"
Ludden st., Gratiot to Mt. Elliott.....	4	"
Lyman st., Crystal to Orleans.....	4	"
Lysander st., crossing e. side Thirteenth 21 ft.....	6	"
" e. line of Thirteenth to Avery .	4	"
" Lincoln to Seventh.....	4	"
" Seventh to w. line of Sixth.....	3	"
" crossing w. side Sixth.....	4	"
" Greenwood to Fourth.....	3	"
McArthur st., Vinewood to 70 ft. e. of e. of same.....	6	"
" 70 ft. e. of Vinewood to Twenty-seventh.....	4	"
McJellian ave., Jefferson to Marietta.....	6	"
" Marietta to Mack.....	8	"
" s. line of Mack to 144 ft. n. of Emmons.....	10	"
" n. from Gratiot 299 ft.....	8	"
McDougall ave., Atwater to Guoin.....	6	"
" Guoin to Wight.....	10	"
" Wight to Clinton.....	6	"
" crossing Waterloo, Cleveland and Arndt sts.....	8	"
" Preston to Gratiot.....	8	"
" Gratiot to Canfield.....	4	"
" Canfield to 187 ft. n. of Garfield.....	6	"
" 187 ft. n. of Garfield to Forest.....	8	"
" Forest to Hancock.....	6	"
" Theodore to Farnsworth.....	6	"
" Palmer to Hendrie.....	6	"
" alley e. of, Mullett to Chestnut.....	4	"
" alley e. of, Waterloo to s. line of Cleveland.....	3	"
" alley e. of, crossing Cleveland.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
McDougall ave., alley e. of, Cleveland to s. line of Arndt.....	8	iron.
" alley e. of, crossing Arndt.....	6	"
" alley e. of, n. line of Arndt to Preston.....	3	"
McGraw ave., Scotteen to 76 ft. e. of LaSalle.....	4	"
" 76 ft. e. of LaSalle to Twenty-sixth.....	6	"
" Twenty-sixth to Grand River.....	4	"
" Winslow to Sullivan.....	6	"
" Sullivan to Sixteenth.....	4	"
McGregor st., Campbell to Junction.....	6	"
McKinstry ave., River st. to n. line of Toledo.....	6	"
" Brandon to Plumer.....	6	"
" alley w. of, Plumer to alley s. of same.....	4	"
McNillian st., crossing Livernois, e. side.....	4	"
" Campbell to 319 ft. w. of Junction.....	6	"
" 319 ft. w. of, to Junction.....	4	"
Mack ave., Ripelle to St. Aubin.....	6	"
" e. from St. Aubin 300 ft.....	4	"
" 109 ft. w. of, to Dubois. w. line.....	3	"
" crossing Dubois.....	4	"
" e. line of Dubois to w. line of Chene.....	3	"
" crossing Chene.....	4	"
" Chene, e. line to Grandy.....	3	"
" Grandy to Jos. Campau.....	6	"
" e. from McDougall 403 ft.....	4	"
" Gratiot to Cadillac.....	6	"
" Gratiot to Mt. Elliott.....	4	"
" crossing Mt. Elliott, w. to e. line.....	6	"
" e. line of Mt. Elliott to Townsend.....	4	"
" Townsend to Baldwin.....	6	"
" Beale to 167 ft. e. of Parker.....	8	"
" 659 ft. w. of, to 577 ft. w. of Fischer.....	8	"
" 207 ft. w. of, to 65 ft. e. of Crane (s).....	8	"
" McClellan to Pennsylvania.....	8	"
" Pennsylvania to e. line of Hamilton.....	6	"
" e. line of Hamilton to e. line of Park.....	8	"
" e. line of Park to e. line of Montclair.....	6	"
" w. from Helen 80 ft.....	6	"
Macomb st., St. Antoine to Elmwood.....	4	"
" alley s. of, alley w. of, to w. line of Brush.....	3	"
" alley s. of, w. line of Brush to St. Antoine.....	4	"
Madison ave., (both sides), Witherell to John R.....	4	"
" Randolph to 18 ft. e. of w. line of Brush.....	6	"
" Brush to Beaubien.....	8	"
" Beaubien to St. Antoine.....	4	"
" alley s. of, John R. to Randolph.....	4	"
Magnolia st., Vinewood to Twenty-seventh.....	4	"
" crossing Twenty-fourth.....	4	"
" Maybury to Sullivan.....	4	"
" Sullivan to w. line of Humboldt.....	3	"
" crossing Humboldt.....	4	"
" e. line of Humboldt to Eighteenth.....	3	"
" Fifteenth to Fourteenth.....	4	"
" Wabash to Thirteenth.....	3	"
" Thirteenth to Harrison.....	4	"
Mansur st., Harper to 78 ft. s. of Piquette.....	4	"
Maple st., Gratiot to Orleans.....	8	"
" Orleans to St. Aubin.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Maple st., St. Aubin to w. line of Dubois.....	8	Iron.
" crossing Dubois.....	8	"
" Dubois to Elmwood.....	8	"
Marcy st., Greenwood to 158 ft. w. of Fourth.....	4	"
" 158 ft. w. of to Fourth.....	3	"
Marietta st., e. from McClellan 521 ft.....	4	"
" 521 ft. e. of e. of McClellan to 109 w. of w. of Pennsylvania..	6	"
Mark st., Thirteenth to 176 ft. w. of Twelfth.....	6	"
" 176 ft. w. of to Twelfth.....	4	"
Marston ct., 16-in. main in Woodward to 124 ft. w. of w. of John R.....	6	"
" Oakland to Hastings.....	6	"
Martin pl., 10-in. main in Woodward to 20 ft. w. of e. of John R.....	8	"
Maybury ave., Michigan to n. line of Ash.....	6	"
" n. line of Ash to 173 ft. n. of Warren.....	8	"
" s. from Hudson 256 ft.....	8	"
Mechanic st., Brush to Beaubien.....	4	"
Medbury ave., Woodward to 364 ft. e. of e. of John R.....	4	"
" 364 ft. e. of e. of John R to 460 ft. e. of e. of same.....	3	"
" 23 ft. w. of e. of Brush to 128 ft. e. of e. of same.....	3	"
" 223 ft. w. of w. of St. Antoine to 149 ft. e. of e. of same.....	3	"
" 140 ft. w. of w. of Hastings to 168 ft. e. of e. of same.....	3	"
" 194 ft. w. of w. of Rivard to 22 ft. w. of e. of same.....	3	"
" 22 ft. w. of e. of Rivard to e. line of same.....	4	"
" 730 ft. w. of to w. line of St. Aubin.....	3	"
" w. line of St. Aubin to Jos. Campau.....	4	"
" Mitchell to e. line of Collins.....	6	"
" 523 ft. w. of to 168 ft. e. of Mt. Elliott.....	6	"
" Canton to Helen.....	6	"
" Helen to Frontenac.....	4	"
" Baldwin to Van Dyke.....	6	"
" alley s. of John R to 360 ft. e. of same.....	4	"
" alley s., crossing Brush.....	6	"
Melbourne ave., crossing e. side of Woodward ave.....	6	"
Meldrum ave., Wight to Jefferson.....	10	"
" Jefferson to 46 ft. n. of Fort.....	6	"
" 46 ft. n. of Fort to 360 ft. n. of Kercheval.....	4	"
" 360 ft. n. of, to 642 ft. n. of Kercheval.....	6	"
" Arndt to Gratiot.....	6	"
" crossing N. Boulevard.....	6	"
" Jefferson to Congress.....	42	"
Merrick ave., Vinewood to Twenty-seventh.....	4	"
" Twenty-third to Tillman.....	4	"
" Tillman to Williams.....	6	"
" w. line of Wabash to Twelfth.....	6	"
" 132 ft. w. of, to Seventeenth.....	4	"
" Twelfth to 35 ft. w. of e. of Avery (s).....	4	"
" 35 ft. w. of s. of Avery (s.) to 26 ft. e. of w. of Avery (n) 99 ft. 6	6	"
" 26 ft. e. of w. of Avery (n.) to Trumbull.....	4	"
" Lincoln to e. line of Greenwood.....	4	"
" e. line of Greenwood to 136 ft. w. of Fourth.....	3	"
" 136 ft. w. of to Fourth.....	4	"
" Third to 26 ft. e. of w. of Second.....	4	"
" 26 ft. e. of w. of Second to 21 ft. w. of e. of same.....	6	"
" 21 ft. w. of e. of Second to Cass.....	4	"
" alley s. of, crossing e. side of Greenwood.....	4	"
" alley s. of, e. line of Greenwood to alley w. of Fourth.....	3	"
Miami ave., Gratiot to Witherell.....	16	"

LOCATION.	DIAM. INCHES.	KIND.
Miami ave., n. side of John R to Witherell	4	iron.
" alley w. of, alley s. of, to Gratiot.....	6	"
" alley w. of, Gratiot to 80 ft. s. of Witherell ..	4	"
" alley e. of, Randolph to John R.....	4	"
Michigan ave., crossing W. Boulevard (s. side).....	6	"
" Livernois to Twenty-fourth.....	6	"
" Twenty-fourth to Foundry.....	8	"
" Vinewood to Tenth.....	24	"
" Tenth to First.....	6	"
" First to Washington ..	10	"
" Cass to Woodward.....	24	"
" alley s. of, Cass to Shelby	4	"
" private alley s. of, Shelby to 110 ft. e. of same.....	3	"
Middle st., alley s. of Grand River to 220 ft. e. of Clifford.....	4	"
Military ave., River st. to 250 ft. n. of Wabash R. R.....	6	"
" 68 ft. n. of Anthon to Toledo.....	6	"
Miller st., crossing Seventh.....	4	"
" Seventh to Sixth.....	3	"
Milwaukee ave., 36 ft. w. of Sullivan to e. line of Eighteenth	4	"
" crossing Fourteenth.....	6	"
" Twelfth to w. line of Avery.....	6	"
" Lincoln to Beaubien.....	6	"
" Beaubien to w. line of Riopelle	4	"
" w. line of Riopelle to Dubois.....	6	"
" Dubois to Chene	4	"
" Craig to w. line of Collins.....	6	"
" crossing Collins.....	3	"
" crossing Mt. Elliott w. line to 2 ft. w. of e.....	6	"
Miner ave., e. from Crane 336 ft.	4	"
" 336 ft. e. of Crane to Holcomb.....	6	"
Minnie ave., 33 ft. n. of River st. to 592 ft. s. of Fort.....	6	iron
" 592 ft. s. of to Fort.....	4	"
Mitchell ave., n. from Gratiot 365 ft.....	6	"
" 365 ft. n. of Gratiot to Canfield.....	4	"
" Canfield to Harper.....	6	"
" n. from Harper 324 ft.....	4	"
" 324 ft. n. of Harper to Trombly.....	6	"
" Trombly to Griffin.....	4	"
" crossing s. side of N. Boulevard.....	6	"
Nobhawk st., crossing Vinewood e. side.....	4	"
Monroe ave., Cadillac square to Randolph.....	12	"
" Randolph to St. Antoine.....	6	"
" St. Antoine to Elmwood.....	4	"
" 90 ft. n. of Cadillac square to Farmer.....	3	"
" 216 ft. w. of to 171 ft. e. of Leih.....	4	"
" w. from Helen 185 ft.	4	"
" alley s. of, alley n. of Cadillac square to Randolph.....	4	"
" alley s. of, Brush to St. Antoine.....	4	"
Montcalm st., Cass to 412 ft. w. of Woodward	3	"
" 412 ft. w. of to Woodward	4	"
" alley e. of Woodward to Brush	4	"
" Brush to w. line of Beaubien	3	"
" crossing w. to e. of Beaubien	6	"
" e. line of, Beaubien to St. Antoine.....	3	"
" St. Antoine to Hastings	6	"
" Hastings to Russell	3	"
" alley s. of, 210 ft. w. of to Beaubien.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Montclair ave., n. from Mack 852 ft.	6	iron.
Monteith st., Vinewood to Twenty-seventh.....	6	"
Moore pl., crossing Hubbard Boulevard.....	6	"
Moran st., Gratiot to Dane.....	6	"
Morrell st., River st. to 87 ft. n. of n. of Christiancy.....	6	"
" 348 ft. s. of Dix to Toledo	6	"
" alley w. of, 21 ft. n. of s. of Brandon to 4 ft. n. of s. of alley s. of Plumer.....	6	"
Mott ave., 16-in. main to e. line of Woodward.....	6	"
" a. from Woodward 558 ft.....	4	"
Mt. Elliott ave., 148 ft. s. of Wight to 285 ft. s. of Kercheval.....	6	"
" 285 ft. s. of Kercheval to Preston.....	8	"
" Preston to Mack.....	10	"
" Mack to Gratiot.....	8	"
" Gratiot to s. line of Hendrie Boulevard, (e. side).....	4	"
" crossing Boulevard.....	8	"
" n. line of Boulevard to 300 ft. n. of Griffin	4	"
" 300 ft. n. of Griffin to Forest Lawn Cemetery.....	6	"
" Gratiot to Warren (w. side)	6	"
" Harper to 182 ft. s. of (e. side)	6	"
Mullett st., Gratiot to Chene.....	30	"
" St. Antoine to Elmwood.....	4	"
Mulberry st., Thirteenth to Twelfth.....	4	"
Myrtle st., Hubbard to Grand River.....	6	"
Nall ave., crossing Vinewood.....	6	"
Napoleon st., Brush to w. line of Beaubien.....	4	"
" crossing Beaubien.....	6	"
" e. line of Beaubien to Russell.....	4	"
National ave., Michigan to Grand River.....	6	"
Navarre st., McClellan to 426 ft. e. of e.....	6	"
Newark st., Twentieth to Nineteenth.....	6	"
Newberry ave., Cavalry to 341 ft. w. of Junction	6	"
" 341 ft. w. of to Junction.....	4	"
Newton ave., w. from Jos. Campau 1,264 ft.....	4	"
Nineteenth st., Fort to Baker.....	4	"
" Baker to Newark.....	6	"
" alley w. of, 197 ft. s. of to Rose.	8	"
Noble st., Seventh to Sixth.....	4	"
" Greenwood to 150 ft. w. of Fourth.....	4	"
" 150 ft. w. of to Fourth.....	3	"
Norton st., 283 ft. e. of to Wesson.	4	"
" Thirty-first to 386 ft. e. of Junction.....	6	"
" 386 ft. e. of to Junction	4	iron.
Oakland ave., Piquette to Trombly.....	6	"
" Milwaukee to s. line of Boulevard.....	4	"
" s. line of N. Boulevard to 24-in. main 87 ft.....	6	"
" 24-in. main in N. Boulevard to 27 ft. n. of s. of Horton.....	10	"
" Horton to Hamlin.....	6	"
" Hamlin to Sidney.....	10	"
" Belmont to Harmon.....	10	"
" Harmon to 180 ft. n. of Woodland.....	8	"
Orchard st., Trumbull to Sixth.....	6	"
" Sixth to w. side of Elton park.....	4	"
" e. side of Elton park to First.....	4	"
Orleans st., Atwater to Jefferson.....	10	"
" Jefferson to 100 ft. n. of n. of Wilkins.....	8	"
" Congress to 75 ft. n. of n. of Wilkins.....	24	"

LOCATION.	DIAM. INCHES.	KIND.
Orleans st., crossing Leland s. side.....	6	iron.
" Alexandrine to s. line of Canfield	6	"
" crossing s. side of Canfield 30 ft.....	30	"
" Garfield to 368 ft. n. of.....	4	"
" 238 ft. n. of Garfield to 195 ft. n. of Forest.....	6	"
" Trombly to Lyman	4	"
Ottawa st., e. from Thirteenth 130 ft.....	3	"
Otis st., e. from Junction 300 ft.....	4	"
" 300 ft. e. of Junction to alley w. of Thirty-first.....	6	"
Owen ave., 16-in. main in Woodward to 1,230 ft. e. of Woodward.....	6	"
Pallister ave., 300 ft. w. of to Hamilton Boulevard.....	6	"
" crossing w. side of Woodward.....	6	"
Palmer ave., Woodward to 254 ft. w. of w. of Brush.....	4	"
" 254 ft. w. of to w. line of Brush.....	6	"
" crossing w. side of Brush.....	4	"
" crossing e. side of Brush.....	6	"
" crossing Beaubien and St. Antoine, n. and s. sides.....	4	"
" crossing Russell and St. Aubin	4	"
" a. line of St. Aubin to 139 ft. w. of Dubois.....	6	"
" 139 ft. w. of Dubois to e. line of Grandy.....	4	"
" Mitchell to McDougall.....	6	"
" crossing w. side of Moran.....	6	"
" 20 ft. e. of w. of Moran to 190 ft. e. of same.....	4	"
" 4 ft. e. of w. of Mt. Elliott to 159 ft. e. of Meldrum.....	6	"
" Townsend to 235 ft. e. of Baldwin.....	6	"
" 235 ft. e. of Baldwin to Van Dyke	4	"
" alley s. of (or Private st. s. of Ferry) 363 ft. w. of to Rivard.....	3	"
" alley s. of (or Private st. s. of Ferry) crossing e. side of Rivard.....	4	"
Park ave., Dix to Toledo	6	"
" (east of city limits), Mack to 368 ft. n. of Canfield.....	6	"
Park pl. East, Michigan to s. line of State	4	"
" crossing State	6	"
Park st., Woodward to Columbia.....	16	"
" Henry to Peterboro.	4	"
" Woodward to Washington.....	6	"
Parker ave., Tont to 260 ft. n. of Coe.....	6	"
" 843 ft. s. of, to 534 ft. n. of Mack.....	6	"
Parkman ave., 473 ft. w. of Seventh to Hamilton Boulevard	4	"
" w. line of Woodward to 16-inch main.....	6	"
Parsons st., Cass to Woodward	4	"
Pennsylvania ave., Jefferson to 1,410 ft. n. of n. of same	6	"
" 145 ft. s. of Mack to 50 ft. n. of Elm.....	6	"
Perry st., Humboldt to Eighteenth.....	4	"
" Harrison to Twelfth.....	6	"
" National to alley w. of Trumbull.....	4	"
" alley e. of Trumbull to Grand River	4	"
" alley s. of, alley w. of Eighth to alley w. of Sixth.....	4	"
Peterboro st., Cass to Woodward	4	"
Philadelphia ave., e. from Russell 349 ft.....	4	"
Pierce st., Dequindre to Jos. Campau.....	4	"
Pine st., crossing e. side of Twelfth.....	4	"
" e. line of Twelfth to National.....	3	"
" National to Grand River.....	4	"
Pitcher st., Seventh to Sixth.....	4	"
" Greenwood to 150 ft. w. of Fourth.....	4	"
" 150 ft. w. of, to Fourth.....	3	"
" alley e. of Third to Cass	4	"

LOCATION.	DIAM. INCHES.	KIND.
Pisgree ave., Hamilton Boulevard to Woodward	6	iron.
Piquette ave., Sullivan to Eighteenth	4	"
" Fourteenth to e. line of same	6	"
" e. line of Fourteenth to Wabash	4	"
" Twelfth, crossing e. side	6	"
" e. line of Twelfth to w. line of Avery	4	"
" Lincoln to Trumbull	6	"
" Greenwood to 194 ft. e. of e. of Fifth	6	"
" Woodward to Beaubien	4	"
" Beaubien to Russell	6	"
" Dubois to 186 ft. e. of e. line of same	6	"
" 186 ft. e. of e. of Dubois to Chene, e. line	4	"
" e. line of Chene to Grandy	6	"
" Mitchell to 33 ft. e. of e. of McDougall Boulevard	6	"
" 33 ft. e. of e. of Boulevard to Collins, w. line	4	"
" w. line of Collins to 336 ft. w. of Mt. Elliott	6	"
" 336 ft. w. of, to Mt. Elliott	4	"
Pleasant ave., n. from River st. 515 ft.	4	"
Plum st., Trumbull to alley e. of	6	"
" alley e. of Trumbull to Second	4	"
Plumer st., Liversols to Welch	4	"
" Wesson to 288 ft. w. of Junction	6	"
" 288 ft. w. of Junction to w. line of McKinstry	4	"
" crossing w. side of McKinstry	6	"
" alley s. of, alley w. of Morrell to 614 ft. w. of alley w. of McKinstry	6	"
" alley s. of, 614 ft. w. of, to alley w. of McKinstry	4	"
Pollard st., 1,342 ft. w. of, to Jos. Campau	4	"
Poplar st., Twenty-fourth to 184 ft. w. of Twenty-third	6	"
" 184 ft. w. of Twenty-third to Tillman	4	"
" Maybury to 376 ft. e. of same	4	"
" 51 ft. w. of Sullivan to alley w. of Humboldt	6	"
" w. line of Fifteenth to 110 ft. e. of Wabash	4	"
" 110 ft. e. of e. of Wabash to Thirteenth	6	"
Porter st., crossing Campbell	6	"
" Ferdinand to McKinstry	4	"
" Scotten to w. line of Hubbard	3	"
" crossing Hubbard, w. side	4	"
" Vinewood to e. line of W. Boulevard	6	"
" e. line of W. Boulevard to Twenty-second	4	"
" Twenty-second to 150 ft. w. of Twenty-first	3	"
" 150 ft. w. of, to Twenty-first	4	"
" Twenty-first to Twentieth	3	"
" Nineteenth to Eighteenth	4	"
" crossing Fourteenth	4	"
" e. from Fourteenth 173 ft.	3	"
" Thirteenth to 210 ft. w. of Twelfth	4	"
" 210 ft. w. of to Twelfth	3	"
" Fourteenth to Tenth	12	"
" alley s. of, Thirteenth to alley e. of same	3	"
" alley s. of, Twelfth to First	4	"
Prentiss ave., Greenwood to alley w. of Fourth	4	"
" Third to Cass	4	"
Preston st., McDougall to Mt. Elliott	4	"
Private way (e. of Russell), s. from Clay 405 ft.	4	"
Pulford ave., Gratiot to Mt. Elliott	4	"
" Meldrum to Beaufait	4	"

LOCATION.	PLAN. NUMBER.	REMARKS.
Putnam ave., Fourteenth to Wabash.....	4	See.
" w. line of Thirteenth to 185 ft. w. of Twelfth.....	4	"
" 185 ft. w. of to Twelfth.....	3	"
" Twelfth to Trumbull.....	4	"
" Lincoln to Fourth.....	4	"
" Third to 223 ft. e. of same.....	4	"
" 223 ft. e. of Third to alley w. of Second.....	4	"
" w. line of Cass to 60 ft. w. of Woodward.....	4	"
" 60 ft. w. of to Woodward.....	6	"
Railway ave., Scotton to LaSalle.....	6	"
Randall st., crossing w. side of Twenty-third, 36 ft.....	4	"
Randolph st., alley s. of Atwater to Jefferson.....	4	"
" Atwater to 24-in. main in Cadillac square.....	8	"
" Larned to Congress.....	4	"
" Congress to s. line of Gratiot.....	6	"
" crossing Gratiot.....	10	"
" Gratiot to Adams.....	6	"
" alley e. of, alley s. of Fort to Champlain.....	4	"
" alley e. of, alley s. of Macomb to Gratiot.....	4	"
Ranspach st., Livernois to Hammond.....	4	"
Raynor st., Clinton to Gratiot.....	4	"
Reed pl., 235 ft. w. of to Greenwood.....	4	"
" Greenwood to 36 feet w. of Fourth.....	3	"
" 36 ft. w. of to Fourth.....	4	"
Reeder ave., 423 ft. w. of Campbell to Junction.....	4	"
Regular ave., Military to Cavalry.....	6	"
Reservoir grounds, n. of basin to 30-in. branch.....	24	"
" s. and w. sides of basin.....	24	"
Rich st., Twenty-eighth to Clark.....	6	"
" Clark to Scotton.....	4	"
" Vinewood to 204 ft. e. of same.....	4	"
" 204 ft. e. of Vinewood to Twenty-seventh.....	6	"
Riopelle st., Atwater to Jefferson.....	8	"
" Jefferson to Larned.....	12	"
" Larned to Adelaide.....	8	"
" Adelaide to 218 ft. n. of Hancock.....	6	"
" Frederick to Kirby.....	6	"
" alley e. of, Willis to Canfield.....	4	"
" alley e. of, Garfield to 223 ft. n. of same.....	4	"
" alley e. of, 223 ft. n. of Garfield to alley s. of Hancock.....	6	"
Rivard st., Atwater to Jefferson.....	8	"
" Jefferson to Clinton.....	10	"
" Clinton to 9 ft. s. of Mullett.....	6	"
" Mullett to Gratiot.....	10	"
" Gratiot to Watson.....	4	"
" Elliot to 90 ft. s. of Warren.....	4	"
" 90 ft. s. of Warren to 21 ft. n. of s. of Farnsworth.....	6	"
" 1 ft. n. of s. of Farnsworth to 36 ft. n. of s. of Kirby.....	16	"
" Kirby to 221 ft. n. of Palmer.....	4	"
" 221 ft. n. of Palmer to Harper.....	6	"
" crossing Piquette.....	4	"
" 5 ft. s. of to 153 ft. n. of N. Boulevard.....	6	"
" 153 ft. n. of N. Boulevard to Clay.....	4	"
" n. from Clay 1,178 ft.....	6	"
" Larned to Congress.....	4	"
River st., main entrance of Exposition Grounds to Campau.....	6	"
" Campau to Pleasant.....	8	"

BOARD OF WATER COMMISSIONERS.

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LOCATION.	DIAM. INCHES.	KIND-
River st., 536 ft. w. of Twenty-fourth to w. side of M. C. R. R. tracks.....	8	iron.
" crossing M. C. R. R. from w. to e. side 270 ft.....	5	"
" e. side M. C. R. R. tracks to Sixth st.....	8	"
" Sixth to Fifth and Fourth to Third.....	4	"
" alley s. of, Third to Second.....	4	"
Roby st., n. from Ferry 225 ft.....	4	"
Rohrs ave., Goethe to 1,983 ft. n. of n. of Mack.....	6	"
" 860 ft. s. of Chapin to 800 ft. s. of Gratiot.....	8	"
" 800 ft. s. of Gratiot to Harper.....	6	"
Romaya st., Campbell to Junction.....	4	"
Rose st., Twentieth to Eighteenth.....	4	"
Rosedale ave., 16-in. main to e. line of Woodward.....	6	"
" e. line of Woodward to w. line of Oakland.....	4	"
" w. line of to Oakland.....	6	"
Rowena st., Woodward to 23 ft. e. of w. of John R.....	4	"
" 23 ft. e. of w. of John R to 23 ft. e. of w. of Brush.....	8	"
" 23 ft. e. of w. of Brush to Riopelle.....	4	"
Rowland st., 24-in. main in Michigan to Grand River.....	8	"
Russell st., Larned to n. line of Congress.....	6	"
" Congress to Macomb.....	8	"
" Mullett to Watson.....	8	"
" Watson to Canfield.....	6	"
" Canfield to s. line of Hendrie.....	10	"
" s. line of Hendrie to s. line of Piquette.....	8	"
" s. line of Piquette to Alger.....	6	"
" alley e. of, Chase to Fort.....	4	"
" alley e. of Willis to 220 ft. n. of same.....	4	"
St. Albertus pl., 22 ft. e. of Dequindre to 260 ft. w. of St. Aubin.....	4	"
" 260 w. of, to St. Aubin.....	3	"
St. Antoine st., Atwater to Congress.....	8	"
" Congress to s. line of Champlain.....	6	"
" crossing Champlain.....	8	"
" n. line of Champlain to n. line of Gratiot.....	6	"
" Jefferson to Congress.....	4	"
" Catherine to Elizabeth.....	12	"
" Elizabeth to Adelaide.....	6	"
" Adelaide to Watson.....	8	"
" Watson to n. line of Farnsworth.....	6	"
" crossing Frederick and Palmer.....	6	"
" s. line of Medbury to s. line of N. Boulevard.....	6	"
" crossing North Boulevard, s. side to 24-inch. main.....	8	"
" alley e. of, North Boulevard to Custer.....	3 & 4	"
St. Aubin ave., Atwater to 22 ft. n. of n. of Harper.....	6	"
" 22 ft. n. of n. of Harper to Trombly.....	8	"
" Trombly to n. line of Boulevard.....	10	"
" Clay to 22 ft. n. of Danforth.....	6	"
" Larned to Congress.....	12	"
" Congress to Champlain.....	36	"
" alley e. of, Kirby to Palmer.....	4	"
St. Clair pl., Nineteenth to alley w. of Eighteenth.....	4	"
St. Joseph st., Russell to Riopelle.....	3	"
" e. line of Riopelle to 310 ft. e. of St. Aubin.....	4	"
" 310 ft. e. of St. Aubin to w. line of Chene.....	3	"
" crossing Chene.....	4	"
" e. line of Chene to 202 ft. e. of same.....	3	"
" 202 ft. e. of Chene to Grandy, w line.....	4	"
" w. line of Grandy to 18 ft. e. of w. of Jos. Campau.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
St. Joseph st., w. line of McDougall to 486 ft. e. of same.	3 & 4	iron.
St. Paul ave., Bellevue to e. line of Concord	4	"
" crossing Frontenac Boulevard	6	"
" e. line of Frontenac Boulevard to e. line of Field	4	"
" Townsend to Baldwin	4	"
" Crane to alley w. of same	4	"
" Holcomb to Belvidere	6	"
Sargent st., St. Aubin to 6 ft. e. of D., G. H. & M. R. R.	6	"
" crossing Collins	6	"
Savoy st., Twenty-fourth to Twenty-third	4	"
" Twenty-second to Twenty-first	4	"
Schiller st., e. from McClellan 245 ft.	4	"
Schiller Boulevard, (n. and s. sides), at w. line of Woodward 8 ft.	4	"
Schneider pl., e. from Ellery 105 ft.	6	"
" 105 ft. e. of Ellery to Mt. Elliott	4	"
Scott st., Riopelle to e. line of St. Aubin	4	"
" e. line of St. Aubin to Dubois	3	"
" crossing Dubois to 156 ft. e. of same	4	"
" 156 ft. e. of Dubois to 499 ft. e. of Chene	3	"
" 499 ft. e. of Chene to Jos. Campau	4	"
" Orleans to Chene	20	"
Scotten ave., Fort to Dix	6	"
" Dix to Buchanan, (s.)	8	"
" Buchanan (s.) to Buchanan (n.)	16	"
" Buchanan to McGraw	6	"
Scovel pl., crossing W. Boulevard to 34 ft. e. of same	6	"
" in Mound "Eckstrom" 50 ft.	4	"
Sears ave., Holcomb to 193 ft. e. of McClellan	4	"
Second st., Front to Woodbridge	6	"
" Woodbridge to alley n. of Jefferson	10	"
" crossing Congress	10	"
" Abbott to alley s. of same	8	"
" Abbott to Grand River	10	"
" alley w. of, Front to alley n. of same	4	"
" alley s. of to Lewis	4	"
Second ave., High to 166 ft. n. of Henry	4	"
" Grand River to Bagg	10	"
" Bagg to s. line of Canfield	6	"
" crossing Canfield, s. line to 30 ft. s. of n.	8	"
" 30 ft. s. of n. to 30 ft. n. of Prentiss	6	"
" (e. side) 16 s. of n. of Forest to 17 ft. s. of n. of Hascock	6	"
" crossing Forest, s. line to 23 n. of n. line	6	"
" (e. side) crossing Putnam and Merrick	6	"
" (w. side) crossing Putnam and Merrick	4	"
" 36 ft. s. of n. of Kirby to 2 ft. n. of n. of Colburn	6	"
" 34 ft. s. of n. of Colburn to s. line of N. Boulevard	6	"
" crossing North Boulevard	8	"
" alley w. of, Forest to Putnam	6	"
Secor pl., s. from Ferry to 267 ft. s. of s.	4	"
Selden ave., Seventh to Sixth st.	4	"
" crossing Greenwood	4	"
" Greenwood to alley w. of Fourth	3	"
" alley w. of to Fourth	4	"
" Third to Woodward	4	"
" alley s. of Greenwood to alley n. of Fourth	4	"
Seventh st., River st. to alley n. of Lafayette	8	"
" alley n. of Lafayette to Bagg	10	"

LOCATION.	DIAM. INCHES.	KIND.
Seventh st., Bagg to Grand River.....	8	Iron.
" Grand River to Calumet.....	6	"
" crossing Calumet s. to n. line.....	8	"
" n. line of Calumet to 684 ft. n. of Stanley.....	6	"
" alley w. of, alley s. of, to Spruce.....	3	"
" alley w. of, alley s. of to Perry.....	4	"
Seventeenth st., Fort to 36 ft. s. of Poplar.....	6	"
" 36 ft. s. of Poplar to s. line of Buchanan.....	4	"
" s. line of Buchanan to Warren.....	6	"
Seward ave., 184 ft. w. of Hamilton Boulevard to Woodward.....	6	"
Seyburn ave., Jefferson to n. line of Agnes.....	6	"
" 463 ft. s. of, to Gratiot.....	6	"
Shady lane, crossing W. Boulevard.....	4	"
" crossing Vinewood.....	6	"
Shakespeare Boulevard, n. and s. sides, at w. line of Woodward ave. 9 ft. 4	"	"
Shelby st., Atwater to Woodbridge.....	6	"
" Woodbridge, crossing n. side.....	8	"
" n. line of Woodbridge to Michigan.....	10	"
" Lafayette to alley s. of Michigan.....	4	"
Sheridan ave., Jefferson to 35 ft. s. of n. of Waterloo.....	6	"
" Mack to Gratiot.....	6	"
" Gratiot to 18 ft. n. of Ferry.....	8	"
Sherman st., Hastings to Elmwood.....	4	"
" Russell to Orleans.....	8	"
Shipperd ave., Champaign to 221 ft. n. of n.....	6	"
" n. from Florene 169 ft.....	6	"
Sibley st., Clifford to Woodward.....	4	"
Sidney ave., 16-inch main in Woodward to Oakland.....	6	"
" Russell to 779 ft. e. of.....	4	"
Sixth st., River st. to Congress.....	16	"
" Congress to Abbott.....	24	"
" River st. to alley n. of.....	4	"
" Abbott to Cherry.....	6	"
" Cherry to 47 ft. s. of Bagg.....	12	"
" 47 ft. s. of Bagg to 24-in. main.....	16	"
" n. from Bagg to Grand River.....	8	"
" Grand River to 473 ft. n. of.....	4	"
" 473 ft. n. of Grand River to Calumet.....	6	"
" crossing Calumet.....	8	"
" n. line of, to 30 ft. n. of Calumet.....	6	"
" 30 ft. n. of n. of Calumet to 365 ft. n. of Lysander.....	4	"
Sixteenth st., Lafayette to Myrtle.....	6	"
" Myrtle to Buchanan.....	8	"
" Buchanan to Grand River.....	10	"
" Grand River to McGraw.....	8	"
" s. from 24-inch main in N. Boulevard 63 ft.....	8	"
" alley w. of, Lafayette to Howard.....	3	"
Smith ave., Woodward to 3 ft. w. of w. of Oakland.....	4	"
" 3 ft. w. of w., to 25 ft. e. of w. of Oakland.....	6	"
South st., Grand River to Noble.....	4	"
Southern ave., Livernols to 152 ft. e. of same.....	4	"
Spencer st., Second to Cass.....	4	"
" alley s. of, alley w. of to First.....	4	"
Sproat st., Cass to Woodward.....	4	"
Spruce st., Thirteenth to Twelfth.....	6	"
" Twelfth to Harrison.....	4	"
" National to alley w. of Trumbull.....	4	"

LOCATION.		DIAM. INCHES.	KIND.
Second st.	alley w. of to Seventh.....	3	iron.
	Seventh to Fifth.....	4	"
	alley s. from Second, alley w. of to first alley w. of Seventh..	3	"
Second st.	Twentieth to Foundry.....	6	"
Second st.	Thilman to Williams.....	6	"
	Grand River to Sullivan.....	6	"
	crossing Humboldt and Eighteenth.....	4	"
	Stanton to Sixteenth.....	6	"
	crossing Fourteenth.....	6	"
	124 ft. w. of to Twelfth.....	4	"
	Commonwealth to Seventh.....	4	"
	Seventh to Greenwood.....	6	"
Second st.	Merrick to Antoinette.....	6	"
	crossing N. Boulevard.....	6	"
Third st.	Livermole to Welch.....	4	"
Third st.	Cass to Woodward.....	10	"
	crossing Washington, e. side, 24 ft.....	24	"
	4 ft. w. of e. of Washington to Woodward.....	30	"
	alley s. of, from alley w. of to First.....	4	"
	alley s. of, from alley w. of Cass to Washington.....	4	"
Third st.	Cass to Woodward.....	4	"
Third st.	Holmes to Canton.....	6	"
Third st.	Michigan to Buchanan.....	6	"
	crossing Warren.....	6	"
	35 ft. s. of n. of Stanley to Baltimore.....	6	"
	crossing N. Boulevard.....	8	"
Second st.	River st. to Fort.....	6	"
Second st.	crossing Brush.....	4	"
	3 ft. e. of e. of Brush to 220 ft. w. of Beaubien.....	6	"
	220 ft. w. of to Beaubien.....	4	"
	Beaubien to Russell.....	6	"
	Riopelle to Dequindre.....	4	"
	Dequindre to St. Aubin.....	6	"
	crossing e. side of St. Aubin.....	4	"
	St. Aubin to w. line of Chene.....	3	"
	crossing Chene.....	4	"
	s. line of to 343 ft. e. of Chene.....	3	"
	343 ft. e. of Chene to Mitchell.....	4	"
	McDougall to Gratiot.....	4	"
Fourth st.	40 ft. s. of Wabash R. R. to Fort.....	6	"
Wabash st.	Wabash to Harrison.....	4	"
	National to alley w. of Trumbull.....	4	"
	123 ft. w. of to Grand River.....	6	"
Green st.	Vinewood to 65 ft. e. of same.....	4	"
	65 ft. e. of Vinewood to 103 ft. w. of Twenty-seventh.....	6	"
	103 ft. w. of to Twenty-seventh.....	4	"
Eleventh st.	Gratiot to Mt. Elliott.....	4	"
	Beaufait to Concord.....	4	"
Tenth st.	crossing Hamilton Boulevard.....	6	"
Tenth st.	River st. to Abbott.....	4	"
	Abbott to Michigan.....	24	"
Thirteenth st.	John R. to 105 ft. e. of Riopelle.....	4	"
	225 ft. w. of St. Aubin to w. line of Dubois.....	4	"
	crossing Dubois.....	6	"
	e. line of Dubois to Grandy.....	4	"
	11 e. of w. of Jos. Campau to 27 ft. w. of e. of McDougall..	6	"
	crossing Collins.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Theodore st., crossing Moran w. side.....	6	iron.
" e. from Moran 375 ft.....	4	"
" crossing Mt. Elliott main to main.....	6	"
" 15 ft. w. of e. of Mt. Elliott to w. line of Beaufait.....	4	"
" Helen to 191 ft. e. of same.....	6	"
" alley s. of, e. and w. of Davis pl. 150 ft.....	4	"
Third st., Front to s. line of River st.....	6	"
" s. line of River to Larned.....	8	"
" Larned to alley n. of.....	6	"
" Larned to Fort st.....	24	"
" Abbott to High.....	6	"
Third ave., Grand River to Bagg.....	8	"
" Bagg to Calumet, s. line.....	6	"
" s. to n. line of Calumet.....	8	"
" n. line of Calumet to Holden, n. line.....	6	"
" crossing Baltimore.....	6	"
" Calumet to Canfield.....	20	"
Thirteenth st., River st. to Fort.....	4	"
" Fort to Howard.....	6	"
" Porter to Ash.....	6	"
" crossing Myrtle.....	6	"
" Magnolia to n. line of Grand River.....	6	"
" n. line of Grand River to 15 ft. n. of Canfield.....	4	"
" 15 ft. n. of Canfield to Hancock.....	6	"
" Hancock to 150 ft. n. of.....	4	"
" 150 ft. n. of Hancock to 30 ft. n. of s. of Kirby.....	6	"
" alley w. of, Bagg to Myrtle.....	6	"
Thirtieth st., 30 feet s. of Jackson to Buchanan.....	6	"
" Devereaux to 153 ft. s. of Warren.....	6	"
Thirty-first st., Michigan to 350 ft. s. of Warren.....	6	"
" 150 ft. s. of, to Norton.....	6	"
Thirty-second st., Michigan to 15 ft. s. of Buchanan.....	4	"
" 15 ft. s. of, to 85 ft. n. of Buchanan.....	6	"
" 85 ft. n. of, to 385 ft. n. of Buchanan.....	8	"
" 385 ft. n. of Buchanan to 82 ft. n. of Horatio.....	6	"
Thirty-third st., Michigan to Horatio.....	6	"
Thirty-fourth st., Michigan to 136 ft. n. of Jackson.....	8	"
" 64 ft. s. of, to 132 ft. n. of Buchanan.....	8	"
" 132 ft. n. of Buchanan to 126 ft. n. of Rich.....	6	"
Thirty-fifth st., Michigan to n. line of Buchanan.....	6	"
" n. line of Buchanan to 277 ft. n. of n. of Rich.....	8	"
Thompson ct., n. of Forest 115 ft.....	4	"
Tillman ave., Michigan to 300 ft. n. of Merrick.....	6	"
" Hudson to McGraw.....	6	"
Toledo ave., Livernols to McKinstry.....	6	"
" McKinstry to 360 ft. e. of Scotten.....	4	"
" 360 ft. e. of Scotten to Hubbard.....	6	"
" w. line of W. Boulevard to Twenty-fifth.....	6	"
Tontl st., Van Dyke to Parker.....	6	"
Torrey st., Twenty-eighth to Lovett.....	4	"
" crossing w. side of Scotten.....	4	"
Townsend ave., Jefferson to 36 ft. n. of s. of Waterloo.....	6	"
" n. from Mack 208 ft.....	6	"
" 208 ft. n. of Mack to s. line of Gratiot.....	4	"
" s. line of to 8-in. main in Gratiot.....	8	"
" 8-in. main in Gratiot to n. line of Palmer.....	6	"

LOCATION.		DEAM. INCHES.	KIND.
Trombly st., Oakland to Hastings		6	iron.
" Crystal to Russell.....		4	"
" Russell to 30 ft. e. of w. of Dubois.....		8	"
" 183 ft. w. of to Chene.....		6	"
" Chene to w. line of Collins.....		4	"
" crossing Collins.....		6	"
" e. line of Collins to 73 ft. e. of Ellery.....		4	"
" 73 ft. e. of Ellery to e. line of Mt. Elliott.....		6	"
Trowbridge ave., 16-in. main to e. line of Woodward.....		6	"
" e. line of to 511 ft. e. of Woodward.....		4	"
Trumbull ave., alley s. of to Abbott.....		10	"
" Abbott to 30 ft. n. of.....		6	"
" Michigan to Plum.....		6	"
" Grand River to alley n. of.....		6	"
" Calumet to Forest.....		8	"
" Forest to 407 ft. n. of G. T. R. R.		6	"
" 497 ft. n. of G. T. R. R. to 50 ft. n. of Piquette.....		8	"
" 50 ft. n. of Piquette to Holden.....		6	"
" alley w. of, Cherry to Pine.....		3	"
" alley w. of, Pine to Myrtle.....		4	"
" alley w. of, alley n. of Grand River to Calumet.....		6	"
Tuscola st., Fourth to Third.....		6	"
" alley s. of, Greenwood to alley w. of Fourth ..		4	"
Twelfth st., 458 ft. s. of to River st.....		4	"
" 17 ft. s. of n. of River to 31 ft. s. of n. of Lafayette.....		4	"
" 36 ft. s. of n. of Howard to 35 ft. s. of n. of Baker.....		8	"
" Baker to Calumet.....		6	"
" Calumet to s. line of Boulevard.....		8	"
" s. line of to 16 ft. s. of n. line of Boulevard.....		10	"
" alley w. of, from 121 ft. s. of to Porter.....		4	"
Twentieth st., Fort to Michigan.....		6	"
Twenty-first st., Fort to Standish		4	"
" alley w. of, Brevoort to Webster.....		4	"
Twenty-second st., Fort to Dalselle.....		6	"
Twenty-third st., Fort to Magnolia		6	"
" Magnolia to 35 ft. s. of Linden.....		3	"
" 35 ft. s. of Linden to 100 ft. n. of Poplar.....		4	"
" 100 ft. n. of Poplar to Kirby.....		6	"
" Kirby to s. line of McGraw.....		4	"
" s. line of McGraw to Ivy pl.....		6	"
Twenty-fourth st., River st. to Fort.....		4	"
" Fort to Baker.....		6	"
" Baker to s. line of Michigan.....		4	"
" s. line of to 32 ft. n. of Michigan		16	"
" 32 ft. n. of to 134 ft. n. of Michigan.....		14	"
" 134 ft. n. of to 192 ft. n. of Michigan.....		20	"
" 192 ft. n. of Michigan to Butternut.....		24	"
" Butternut to Buchanan.....		10	"
" Buchanan to n. line of McGraw.....		4	"
" n. line of McGraw to Choep pl.....		6	"
Twenty-fifth st., Howard to Baker.....		4	"
" Baker to Toledo.....		6	"
" E st. to Michigan.....		4	"
" Michigan to Hancock.....		6	"
" crossing Warren		6	"
" 69 ft s of Hudson to n. line of McGraw.....		6	"

LOCATION.	DIAM. INCHES.	KIND.
Twenty-sixth st., 213 ft. s. of E st. to 146 ft. s. of Hancock.....	6	Iron.
" 146 ft. s. of to 421 ft. n. of Hancock.....	8	"
" 421 ft. n. of Hancock to McGraw.....	6	"
Twenty-seventh st., Myrtle to s. line of Buchanan.....	6	"
" crossing Buchanan.....	8	"
" n. line of Buchanan to 32 ft. n. of s. of McGraw.	6	"
Twenty-eighth st. Michigan to 14 ft. n. of Rich.....	6	"
Twenty-ninth st., 565 ft. s. of Michigan to Buchanan.....	6	"
Union st., Fifth to Fourth.....	3	"
Uthes st., McKinstry to Clark.....	4	"
Van Dyke ave., Jefferson to 150 ft. n. of Waterloo.....	8	"
" 276 ft. s. of n. line of, to n. line of Worcester.....	8	"
" n. line of Worcester to Mack.....	6	"
" Mack to n. line of Gratiot.....	8	"
" Gratiot to Harper.....	6	"
" Jefferson connecting with 42-inch main 22 ft. of.....	10	"
Vincennes st., McClellan to 172 ft. e. of et of same.....	6	"
Vine st., crossing e. side of Fifth.....	4	"
" Fifth to Fourth.....	3	"
Vinewood ave., Fort to Buchanan.....	24	"
" Buchanan to Merrick.....	10	"
" Merrick to Grand River.....	8	"
" Fort to 430 ft. n. of Toledo.....	6	"
" F st. to Buchanan.....	6	"
" crossing Vinewood, s. of M. C. R. R. betw. mains, 23 ft.	6	"
Virginia ave., Hamilton Boulevard to w. line of Woodward, n. and s. sides, 4	"	"
" 5 ft. e. of w. line of, to 16-inch main in Woodward.....	6	"
Vingar st., Twenty-eighth to Lovett.....	6	"
" crossing e. side of Scotten.....	6	"
" La Salle to Vinewood.....	6	"
Wabash ave., n. line of M. C. R. R. to n. line of Ottawa.....	6	"
" n. line of Ottawa to s. line of Buchanan.....	4	"
" s. line of Buchanan to s. line of Grand River.....	8	"
" crossing Grand River.....	6	"
" n. line of Grand River to 18 ft. s. of s. line of L. S. & M. S. R. R.	8	"
" 18 ft. s. of s. of L. S. R. R. to 186 ft. n. of Piquette.....	6	"
" crossing N. Boulevard.....	6	"
Walbridge st., Baldwin to Van Dyke.....	6	"
Walker st., Atwater to Jefferson.....	4	"
Walnut st., 264 ft. w. of to Van Dyke.....	6	"
Warren ave., w. line of Scotten to Grand River.....	6	"
" Sixteenth to Fourteenth.....	4	"
" alley w. of Wabash to Avery.....	4	"
" Twelfth to 195 ft. w. of (n. side).....	4	"
" Trumbull to 106 ft. w. of Seventh.....	6	"
" 106 ft. w. of Seventh to Greenwood.....	4	"
" Greenwood to Third.....	6	"
" Third to Cass.....	8	"
" 6 ft. e. of w. of Cass to 105 ft. e. of Riopelle.....	4	"
" Warren ct. to w. line of Dubois.....	4	"
" crossing Dubois 56 ft.	6	"
" e. line of Dubois to e. line of Grandy.....	4	"
" 12 ft. e. of w. of to 10 ft. w. of e. of Jos. Campan.....	6	"
" crossing Collins.....	6	"
" w. line of Moran to Detloff ct.....	6	"
" 2 ft. e. of w. to e. line of Mt. Elliott.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Orleans st., crossing Leland s. side.....	6	iron.
“ Alexandrine to s. line of Canfield	6	“
“ crossing s. side of Canfield 80 ft.....	30	“
“ Garfield to 238 ft. n. of.....	4	“
“ 238 ft. n. of Garfield to 198 ft. n. of Forest.....	6	“
“ Trombly to Lyman	4	“
Ottawa st., e. from Thirteenth 180 ft.....	3	“
Otis st., e. from Junction 300 ft.....	4	“
“ 300 ft. e. of Junction to alley w. of Thirty-first.....	6	“
Owen ave., 16-in. main in Woodward to 1,230 ft. e. of Woodward.....	6	“
Pallister ave., 260 ft. w. of to Hamilton Boulevard.....	6	“
“ crossing w. side of Woodward.....	6	“
Palmer ave., Woodward to 354 ft. w. of w. of Brush.....	4	“
“ 354 ft. w. of to w. line of Brush.....	6	“
“ crossing w. side of Brush.....	4	“
“ crossing e. side of Brush.....	6	“
“ crossing Beaubien and St. Antoine, n. and s. sides.....	4	“
“ crossing Russell and St. Aubin	4	“
“ e. line of St. Aubin to 139 ft. w. of Dubois.....	6	“
“ 139 ft. w. of Dubois to e. line of Grandy.....	4	“
“ Mitchell to McDougall.....	6	“
“ crossing w. side of Moran.....	6	“
“ 30 ft. e. of w. of Moran to 190 ft. e. of same.....	4	“
“ 4 ft. e. of w. of Mt. Elliott to 159 ft. e. of Meldrum.....	6	“
“ Townsend to 235 ft. e. of Baldwin.....	6	“
“ 235 ft. e. of Baldwin to Van Dyke	4	“
“ alley s. of (or Private st. s. of Ferry) 323 ft. w. of to Rivard.....	3	“
“ alley s. of (or Private st. s. of Ferry) crossing e. side of Rivard.....	4	“
Park ave., Dix to Toledo	6	“
“ (east of city limits), Mack to 368 ft. n. of Canfield.....	6	“
Park pl. East, Michigan to s. line of State	4	“
“ crossing State	6	“
Park st., Woodward to Columbia.....	16	“
“ Henry to Peterboro.....	4	“
“ Woodward to Washington.....	6	“
Parker ave., Tont to 250 ft. n. of Coe.....	6	“
“ 843 ft. s. of, to 584 ft. n. of Mack.....	6	“
Parkman ave., 473 ft. w. of Seventh to Hamilton Boulevard.....	4	“
“ w. line of Woodward to 16-inch main.....	6	“
Parsons st., Cass to Woodward	4	“
Pennsylvania ave., Jefferson to 1,410 ft. n. of n. of same	6	“
“ 145 ft. s. of Mack to 50 ft. n. of Elsa.....	6	“
Perry st., Humboldt to Eighteenth.....	4	“
“ Harrison to Twelfth.....	6	“
“ National to alley w. of Trumbull.....	4	“
“ alley e. of Trumbull to Grand River	4	“
“ alley s. of, alley w. of Eighth to alley w. of Sixth.....	4	“
Peterboro st., Cass to Woodward	4	“
Philadelphia ave., e. from Russell 340 ft.....	4	“
Pierce st., Dequindre to Jos. Campau.....	4	“
Pine st., crossing e. side of Twelfth.....	4	“
“ e. line of Twelfth to National.....	3	“
“ National to Grand River	4	“
Pitcher st., Seventh to Sixth.....	4	“
“ Greenwood to 150 ft. w. of Fourth.....	4	“
“ 150 ft. w. of, to Fourth	3	“
“ alley e. of Third to Cass	4	“

LOCATION.	DIAM. INCHES.	KIND.
Pingree ave., Hamilton Boulevard to Woodward	6	iron.
Piquette ave., Sullivan to Eighteenth	4	"
" Fourteenth to e. line of same	6	"
" e. line of Fourteenth to Wabash	4	"
" Twelfth, crossing e. side	6	"
" e. line of Twelfth to w. line of Avery	4	"
" Lincoln to Trumbull	6	"
" Greenwood to 184 ft. e. of e. of Fifth	6	"
" Woodward to Beaubien	4	"
" Beaubien to Russell	6	"
" Dubois to 186 ft. e. of e. line of same	6	"
" 186 ft. e. of e. of Dubois to Chene, e. line	4	"
" e. line of Chene to Grandy	6	"
" Mitchell to 32 ft. e. of e. of McDougall Boulevard	6	"
" 32 ft. e. of e. of Boulevard to Collins, w. line	4	"
" w. line of Collins to 326 ft. w. of Mt. Elliott	6	"
" 326 ft. w. of, to Mt. Elliott	4	"
Pleasant ave., n. from River st. 515 ft.	4	"
Plum st., Trumbull to alley e. of	6	"
" alley e. of Trumbull to Second	4	"
Plumer st., Livernois to Welch	4	"
" Weason to 283 ft. w. of Junction	6	"
" 283 ft. w. of Junction to w. line of McKinstry	4	"
" crossing w. side of McKinstry	6	"
" alley s. of, alley w. of Morrell to 614 ft. w. of alley w. of McKinstry	6	"
" alley s. of, 614 ft. w. of, to alley w. of McKinstry	4	"
Pollard st., 1,242 ft. w. of, to Jos. Campau	4	"
Poplar st., Twenty-fourth to 184 ft. w. of Twenty-third	6	"
" 184 ft. w. of Twenty-third to Tillman	4	"
" Maybury to 276 ft. e. of same	4	"
" 51 ft. w. of Sullivan to alley w. of Humboldt	6	"
" w. line of Fifteenth to 110 ft. e. of Wabash	4	"
" 110 ft. e. of e. of Wabash to Thirteenth	6	"
Porter st., crossing Campbell	6	"
" Ferdinand to McKinstry	4	"
" Scotten to w. line of Hubbard	3	"
" crossing Hubbard, w. side	4	"
" Vinewood to e. line of W. Boulevard	6	"
" e. line of W. Boulevard to Twenty-second	4	"
" Twenty-second to 150 ft. w. of Twenty-first	3	"
" 150 ft. w. of, to Twenty-first	4	"
" Twenty-first to Twentieth	3	"
" Nineteenth to Eighteenth	4	"
" crossing Fourteenth	4	"
" e. from Fourteenth 172 ft.	3	"
" Thirteenth to 210 ft. w. of Twelfth	4	"
" 210 ft. w. of to Twelfth	3	"
" Fourteenth to Tenth	12	"
" alley s. of, Thirteenth to alley e. of same	3	"
" alley s. of, Twelfth to First	4	"
Prentiss ave., Greenwood to alley w. of Fourth	4	"
" Third to Cass	4	"
Preston st., McDougall to Mt. Elliott	4	"
Private way (e. of Russell), s. from Clay 405 ft.	4	"
Pulford ave., Gratiot to Mt. Elliott	4	"
" Meldrum to Beaufait	4	"

LOCATION.	SEAM- FOOTING.	KIND.
Putnam ave., Fourteenth to Wabash.....	4	Seam.
" w. line of Thirteenth to 185 ft. w. of Twelfth.....	4	"
" 185 ft. w. of to Twelfth.....	3	"
" Twelfth to Trumbull.....	4	"
" Lincoln to Fourth.....	4	"
" Third to 223 ft. e. of same.....	4	"
" 223 ft. e. of Third to alley w. of Second.....	6	"
" w. line of Cass to 60 ft. w. of Woodward.....	4	"
" 60 ft. w. of to Woodward.....	6	"
Railway ave., Scotton to LaSalle.....	6	"
Randall st., crossing w. side of Twenty-third, 36 ft.....	4	"
Randolph st., alley s. of Atwater to Jefferson.....	4	"
" Atwater to 34-in. main in Cadillac square.....	8	"
" Larned to Congress.....	4	"
" Congress to s. line of Gratiot.....	6	"
" crossing Gratiot.....	10	"
" Gratiot to Adams.....	6	"
" alley e. of, alley s. of Fort to Champlain.....	4	"
" alley e. of, alley s. of Macomb to Gratiot.....	4	"
Ranspach st., Livernois to Hammond.....	4	"
Raynor st., Clinton to Gratiot.....	4	"
Reed pl., 225 ft. w. of to Greenwood.....	4	"
" Greenwood to 36 feet w. of Fourth.....	3	"
" 36 ft. w. of to Fourth.....	4	"
Reeder ave., 438 ft. w. of Campbell to Junction.....	4	"
Regular ave., Military to Cavalry.....	6	"
Reservoir grounds, n. of basin to 30-in. branch.....	24	"
" s. and w. sides of basin.....	24	"
Rich st., Twenty-eighth to Clark.....	8	"
" Clark to Scotton.....	4	"
" Vinewood to 204 ft. e. of same.....	4	"
" 204 ft. e. of Vinewood to Twenty-seventh.....	6	"
Riopelle st., Atwater to Jefferson.....	8	"
" Jefferson to Larned.....	12	"
" Larned to Adelaide.....	8	"
" Adelaide to 218 ft. n. of Hancock.....	6	"
" Frederick to Kirby.....	6	"
" alley e. of, Willis to Canfield.....	4	"
" alley e. of, Garfield to 223 ft. n. of same.....	4	"
" alley e. of, 223 ft. n. of Garfield to alley s. of Hancock.....	6	"
Rivard st., Atwater to Jefferson.....	8	"
" Jefferson to Clinton.....	10	"
" Clinton to 9 ft. s. of Mullett.....	6	"
" Mullett to Gratiot.....	10	"
" Gratiot to Watson.....	4	"
" Elliot to 90 ft. s. of Warren.....	4	"
" 90 ft. s. of Warren to 21 ft. n. of s. of Farnsworth.....	6	"
" 1 ft. n. of s. of Farnsworth to 36 ft. n. of s. of Kirby.....	16	"
" Kirby to 221 ft. n. of Palmer.....	4	"
" 221 ft. n. of Palmer to Harper.....	2	"
" crossing Piquette.....	4	"
" 5 ft. s. of to 153 ft. n. of N. Boulevard.....	6	"
" 153 ft. n. of N. Boulevard to Clay.....	4	"
" n. from Clay 1,178 ft.....	6	"
" Larned to Congress.....	4	"
River st., main entrance of Exposition Grounds to Campau.....	6	"
" Campau to Pleasant.....	8	"

LOCATION.	DIAM. INCHES.	KIND-
River st., 535 ft. w. of Twenty-fourth to w. side of M. C. R. R. tracks.....	8	iron.
" crossing M. C. R. R. from w. to e. side 270 ft.....	5	"
" e. side M. C. R. R. tracks to Sixth st.....	8	"
" Sixth to Fifth and Fourth to Third.....	4	"
" alley s. of, Third to Second.....	4	"
Roby st., n. from Ferry 325 ft.....	4	"
Bohns ave., Goethe to 1,263 ft. n. of n. of Mack.....	6	"
" 360 ft. s. of Chapin to 800 ft. s. of Gratiot.....	8	"
" 800 ft. s. of Gratiot to Harper.....	6	"
Romney st., Campbell to Junction.....	4	"
Rose st., Twentieth to Eighteenth.....	4	"
Rosedale ave., 16-in. main to e. line of Woodward.....	6	"
" e. line of Woodward to w. line of Oakland.....	4	"
" w. line of to Oakland.....	6	"
Rowena st., Woodward to 23 ft. e. of w. of John R.....	4	"
" 23 ft. e. of w. of John R to 23 ft. e. of w. of Brush.....	8	"
" 23 ft. e. of w. of Brush to Riopelle.....	4	"
Rowland st., 24-in. main in Michigan to Grand River.....	8	"
Russell st., Larned to n. line of Congress.....	6	"
" Congress to Macomb.....	8	"
" Mullett to Watson.....	8	"
" Watson to Canfield.....	6	"
" Canfield to s. line of Hendrie.....	10	"
" s. line of Hendrie to s. line of Piquette.....	8	"
" s. line of Piquette to Alger.....	6	"
" alley e. of, Chase to Fort.....	4	"
" alley e. of Willis to 220 ft. n. of same.....	4	"
St. Albertus pl., 22 ft. e. of Dequindre to 260 ft. w. of St. Aubin.....	4	"
" 260 w. of, to St. Aubin.....	3	"
St. Antoine st., Atwater to Congress.....	8	"
" Congress to s. line of Champlain.....	6	"
" crossing Champlain.....	8	"
" n. line of Champlain to n. line of Gratiot.....	6	"
" Jefferson to Congress.....	4	"
" Catherine to Elizabeth.....	12	"
" Elizabeth to Adelaide.....	6	"
" Adelaide to Watson.....	8	"
" Watson to n. line of Farnsworth.....	6	"
" crossing Frederick and Palmer.....	6	"
" s. line of Medbury to s. line of N. Boulevard.....	6	"
" crossing North Boulevard, s. side to 24-inch. main.....	8	"
" alley e. of, North Boulevard to Custer.....	3 & 4	"
St. Aubin ave., Atwater to 22 ft. n. of n. of Harper.....	6	"
" 22 ft. n. of n. of Harper to Trombly.....	8	"
" Trombly to n. line of Boulevard.....	10	"
" Clay to 22 ft. n. of Danforth.....	6	"
" Larned to Congress.....	12	"
" Congress to Champlain.....	36	"
" alley e. of, Kirby to Palmer.....	4	"
St. Clair pl., Nineteenth to alley w. of Eighteenth.....	4	"
St. Joseph st., Russell to Riopelle.....	3	"
" e. line of Riopelle to 310 ft. e. of St. Aubin.....	4	"
" 310 ft. e. of St. Aubin to w. line of Chene.....	3	"
" crossing Chene.....	4	"
" e. line of Chene to 202 ft. e. of same.....	3	"
" 202 ft. e. of Chene to Grandy, w line.....	4	"
" w. line of Grandy to 18 ft. e. of w. of Jos. Campau.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
St. Joseph st., w. line of McDougall to 436 ft. e. of same.	3 & 4	iron.
St. Paul ave., Bellevue to e. line of Concord	4	"
" crossing Frontenac Boulevard	6	"
" e. line of Frontenac Boulevard to e. line of Field	4	"
" Townsend to Baldwin	4	"
" Crane to alley w. of same	4	"
" Holcomb to Belvidere	6	"
Sargent st., St. Aubin to 6 ft. e. of D., G. H. & M. R. R.	6	"
" crossing Collins	6	"
Savoy st., Twenty-fourth to Twenty-third	4	"
" Twenty-second to Twenty-first	4	"
Schiller st., e. from McClellan 245 ft.	4	"
Schiller Boulevard, (n. and s. sides), at w. line of Woodward 8 ft.	4	"
Schneider pl., e. from Ellery 105 ft.	6	"
" 105 ft. e. of Ellery to Mt. Elliott	4	"
Scott st., Riopelle to e. line of St. Aubin	4	"
" e. line of St. Aubin to Dubois	3	"
" crossing Dubois to 156 ft. e. of same	4	"
" 156 ft. e. of Dubois to 499 ft. e. of Chene	3	"
" 499 ft. e. of Chene to Jos. Campau	4	"
" Orleans to Chene	30	"
Scotten ave., Fort to Dix	6	"
" Dix to Buchanan, (s.)	8	"
" Buchanan, (s.) to Buchanan, (n.)	16	"
" Buchanan to McGraw	6	"
Scovel pl., crossing W. Boulevard to 24 ft. e. of same	6	"
" in Mound "Eckstrom" 50 ft.	4	"
Sears ave., Holcomb to 193 ft. e. of McClellan	4	"
Second st., Front to Woodbridge	6	"
" Woodbridge to alley n. of Jefferson	10	"
" crossing Congress	10	"
" Abbott to alley s. of same	8	"
" Abbott to Grand River	10	"
" alley w. of, Front to alley n. of same	4	"
" " alley s. of to Lewis	4	"
Second ave., High to 166 ft. n. of Henry	4	"
" Grand River to Bagg	10	"
" Bagg to s. line of Canfield	6	"
" crossing Canfield, s. line to 20 ft. s. of n.	8	"
" 20 ft. s. of n. to 30 ft. n. of Prentiss	6	"
" (e. side) 16 s. of n. of Forest to 17 ft. s. of n. of Hancock	6	"
" crossing Forest, s. line to 22 n. of n. line	6	"
" (e. side) crossing Putnam and Merrick	6	"
" (w. side) crossing Putnam and Merrick	4	"
" 26 ft. s. of n. of Kirby to 3 ft. n. of n. of Colburn	6	"
" 34 ft. s. of n. of Colburn to s. line of N. Boulevard	6	"
" crossing North Boulevard	8	"
" alley w. of, Forest to Putnam	6	"
Secor pl., s. from Ferry to 267 ft. s. of s.	4	"
Selden ave., Seventh to Sixth st.	4	"
" crossing Greenwood	4	"
" Greenwood to alley w. of Fourth	3	"
" alley w. of to Fourth	4	"
" Third to Woodward	4	"
" alley s. of Greenwood to alley n. of Fourth	4	"
Seventh st., River st. to alley n. of Lafayette	8	"
" alley n. of Lafayette to Bagg	10	"

LOCATION.	DIAM. INCHES.	KIND.
Seventh st., Bagb to Grand River.....	8	Iron.
" Grand River to Calumet.....	6	"
" crossing Calumet s. to n. line.....	8	"
" n. line of Calumet to 684 ft. n. of Stanley.....	6	"
" alley w. of, alley s. of, to Spruce.....	3	"
" alley w. of, alley s. of to Perry.....	4	"
Seventeenth st., Fort to 28 ft. s. of Poplar.....	6	"
" 28 ft. s. of Poplar to s. line of Buchanan.....	4	"
" s. line of Buchanan to Warren.....	6	"
Seward ave., 184 ft. w. of Hamilton Boulevard to Woodward.....	6	"
Seyburn ave., Jefferson to n. line of Agnes.....	6	"
" 462 ft. s. of, to Gratiot.....	6	"
Shady lane, crossing W. Boulevard.....	4	"
" crossing Vinewood.....	6	"
Shakespeare Boulevard, n. and s. sides, at w. line of Woodward ave. 9 ft. 4	"	"
Shelby st., Atwater to Woodbridge.....	6	"
" Woodbridge, crossing n. side.....	8	"
" n. line of Woodbridge to Michigan.....	10	"
" Lafayette to alley s. of Michigan.....	4	"
Sheridan ave., Jefferson to 35 ft. s. of n. of Waterloo.....	6	"
" Mack to Gratiot.....	6	"
" Gratiot to 18 ft. n. of Ferry.....	8	"
Sherman st., Hastings to Elmwood.....	4	"
" Russell to Orleans.....	8	"
Shipherd ave., Champlain to 221 ft. n. of n.....	6	"
" n. from Florene 169 ft.....	6	"
Sibley st., Clifford to Woodward.....	4	"
Sidney ave., 16-inch main in Woodward to Oakland.....	6	"
" Russell to 779 ft. e. of.....	4	"
Sixth st., River st. to Congress.....	16	"
" Congress to Abbott.....	24	"
" River st. to alley n. of.....	4	"
" Abbott to Cherry.....	6	"
" Cherry to 47 ft. s. of Bagb.....	12	"
" 47 ft. s. of Bagb to 24-in. main.....	16	"
" n. from Bagb to Grand River.....	8	"
" Grand River to 473 ft. n. of.....	4	"
" 473 ft. n. of Grand River to Calumet.....	6	"
" crossing Calumet.....	8	"
" n. line of, to 20 ft. n. of Calumet.....	6	"
" 20 ft. n. of n. of Calumet to 265 ft. n. of Lysander.....	4	"
Sixteenth st., Lafayette to Myrtle.....	6	"
" Myrtle to Buchanan.....	8	"
" Buchanan to Grand River.....	10	"
" Grand River to McGraw.....	8	"
" s. from 24-inch main in N. Boulevard 63 ft.....	8	"
" alley w. of, Lafayette to Howard.....	8	"
Smith ave., Woodward to 3 ft. w. of w. of Oakland.....	4	"
" 3 ft. w. of w., to 25 ft. e. of w. of Oakland.....	6	"
South st., Grand River to Noble.....	4	"
Southern ave., Livernois to 152 ft. e. of same.....	4	"
Spencer st., Second to Cass.....	4	"
" alley s. of, alley w. of to First.....	4	"
Sproat st., Cass to Woodward.....	4	"
Spruce st., Thirteenth to Twelfth.....	6	"
" Twelfth to Harrison.....	4	"
" National to alley w. of Trumbull.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
" Spruce st., alley w. of to Seventh.....	3	iron.
" Seventh to Fifth.....	4	"
" alley s. from Second, alley w. of to first alley w. of Seventh..	3	"
Standish st., Twentieth to Foundry.....	6	"
Stanley ave., Tillman to Williams.....	6	"
" Grand River to Sullivan.....	6	"
" crossing Humboldt and Eighteenth.....	4	"
" Stanton to Sixteenth.....	6	"
" crossing Fourteenth.....	6	"
" 183 ft. w. of to Twelfth.....	4	"
" Commonwealth to Seventh..	4	"
" Seventh to Greenwood.....	6	"
Stanton ave., Merrick, to Antoinette.....	6	"
" crossing N. Boulevard.....	6	"
Stark ave., Liversols to Welch.....	4	"
State st., Cass to Woodward.....	10	"
" crossing Washington, e. side, 24 ft.....	24	"
" 80 ft. w. of e. of Washington to Woodward.....	30	"
" alley s. of, from alley w. of to First.....	4	"
" alley s. of, from alley w. of Cass to Washington.....	4	"
Stimson pl., Cass to Woodward.....	4	"
Stuart st., Bellevue to Canton.....	6	"
Sullivan ave., Michigan to Buchanan.....	6	"
" crossing Warren.....	6	"
" 25 ft. s. of n. of Stanley to Baltimore..	6	"
" crossing N. Boulevard.....	8	"
Summit ave., River st. to Fort.....	6	"
Superior st., crossing Brush.....	4	"
" 3 ft. e. of e. of Brush to 230 ft. w. of Beaubien.....	6	"
" 230 ft. w. of to Beaubien.....	4	"
" Beaubien to Russell.....	6	"
" Riopelle to Dequindre.....	4	"
" Dequindre to St. Aubin.....	6	"
" crossing e. side of St. Aubin..	4	"
" St. Aubin to w. line of Chene.....	3	"
" crossing Chene.....	4	"
" e. line of to 343 ft. e. of Chene.....	3	"
" 343 ft. e. of Chene to Mitchell.....	4	"
" McDougall to Gratiot.....	4	"
Swain ave., 40 ft. s. of Wabash R. R. to Fort.....	6	"
Sycamore st., Wabash to Harrison.....	4	"
" National to alley w. of Trumbull.....	4	"
" 123 ft. w. of to Grand River.....	6	"
Sylvan st., Vinewood to 65 ft. e. of same.....	4	"
" 65 ft. e. of Vinewood to 105 ft. w. of Twenty-seventh.....	6	"
" 105 ft. w. of to Twenty-seventh.....	4	"
Sylvester st., Gratiot to Mt. Elliott.....	4	"
" Beaufait to Concord.....	4	"
Taylor ave., crossing Hamilton Boulevard.....	6	"
Tenth st., River st. to Abbott.....	5	"
" Abbott to Michigan.....	24	"
Theodore st., John R. to 106 ft. e. of Riopelle..	4	"
" 268 ft. w. of St. Aubin to w. line of Dubois.....	4	"
" crossing Dubois.....	6	"
" e. line of Dubois to Grandy.....	4	"
" 11 e. of w. of Jos. Campau to 27 ft. w. of e. of McDougall..	6	"
" crossing Collins.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Theodore st., crossing Moran w. side.....	6	iron.
" e. from Moran 375 ft.....	4	"
" crossing Mt. Elliott main to main.....	6	"
" 15 ft. w. of e. of Mt. Elliott to w. line of Beaufait.....	4	"
" Helen to 191 ft. e. of same.....	6	"
" alley s. of, e. and w. of Davis pl. 150 ft.....	4	"
Third st., Front to s. line of River st.....	6	"
" s. line of River to Larned.....	8	"
" Larned to alley n. of.....	6	"
" Larned to Fort st.....	24	"
" Abbott to High.....	6	"
Third ave., Grand River to Bagg.....	8	"
" Bagg to Calumet, s. line.....	6	"
" s. to n. line of Calumet.....	8	"
" n. line of Calumet to Holden, n. line.....	6	"
" crossing Baltimore.....	6	"
" Calumet to Canfield.....	30	"
Thirteenth st., River st. to Fort.....	4	"
" Fort to Howard.....	6	"
" Porter to Ash.....	6	"
" crossing Myrtle.....	6	"
" Magnolia to n. line of Grand River.....	6	"
" n. line of Grand River to 15 ft. n. of Canfield.....	4	"
" 15 ft. n. of Canfield to Hancock.....	6	"
" Hancock to 150 ft. n. of.....	4	"
" 150 ft. n. of Hancock to 20 ft. n. of s. of Kirby.....	6	"
" alley w. of, Bagg to Myrtle.....	6	"
Thirtieth st., 30 feet s. of Jackson to Buchanan.....	6	"
" Devereaux to 153 ft. s. of Warren.....	6	"
Thirty-first st., Michigan to 250 ft. s. of Warren.....	6	"
" 150 ft. s. of, to Norton.....	6	"
Thirty-second st., Michigan to 15 ft. s. of Buchanan.....	4	"
" 15 ft. s. of, to 85 ft. n. of Buchanan.....	6	"
" 85 ft. n. of, to 335 ft. n. of Buchanan.....	8	"
" 335 ft. n. of Buchanan to 82 ft. n. of Horatio.....	6	"
Thirty-third st., Michigan to Horatio.....	6	"
Thirty-fourth st., Michigan to 136 ft. n. of Jackson.....	8	"
" 64 ft. s. of, to 132 ft. n. of Buchanan.....	8	"
" 132 ft. n. of Buchanan to 126 ft. n. of Rich.....	6	"
Thirty-fifth st., Michigan to n. line of Buchanan.....	6	"
" n. line of Buchanan to 277 ft. n. of n. of Rich.....	8	"
Thompson ct., n. of Forest 115 ft.....	4	"
Tillman ave., Michigan to 300 ft. n. of Merrick.....	6	"
" Hudson to McGraw.....	6	"
Toledo ave., Livernois to McKinstry.....	6	"
" McKinstry to 360 ft. e. of Scotten.....	4	"
" 360 ft. e. of Scotten to Hubbard.....	6	"
" w. line of W. Boulevard to Twenty-fifth.....	6	"
Tonti st., Van Dyke to Parker.....	6	"
Torrey st., Twenty-eighth to Lovett.....	4	"
" crossing w. side of Scotten.....	4	"
Townsend ave., Jefferson to 36 ft. n. of s. of Waterloo.....	6	"
" n. from Mack 208 ft.....	6	"
" 208 ft. n. of Mack to s. line of Gratiot.....	4	"
" s. line of to 8-in. main in Gratiot.....	8	"
" 8-in. main in Gratiot to n. line of Palmer.....	6	"

LOCATION.	DEAM. INCHES.	KIND
Trombly st., Oakland to Hastings	6	iron.
" Crystal to Russell.....	4	"
" Russell to 30 ft. e. of w. of Dubois.....	8	"
" 183 ft. w. of to Chene.....	6	"
" Chene to w. line of Collins.....	4	"
" crossing Collins.....	6	"
" e. line of Collins to 73 ft. e. of Ellery.....	4	"
" 73 ft. e. of Ellery to e. line of Mt. Elliott.....	6	"
Trowbridge ave., 16-in. main to e. line of Woodward.....	6	"
" e. line of to 511 ft. e. of Woodward.....	4	"
Trumbull ave., alley s. of to Abbott.....	10	"
" Abbott to 30 ft. n. of.....	6	"
" Michigan to Plum.....	6	"
" Grand River to alley n. of.....	6	"
" Calumet to Forest.....	8	"
" Forest to 497 ft. n. of G. T. R. R.....	6	"
" 497 ft. n. of G. T. R. R. to 50 ft. n. of Piquette.....	8	"
" 50 ft. n. of Piquette to Holden.....	6	"
" alley w. of, Cherry to Pine.....	3	"
" alley w. of, Pine to Myrtle.....	4	"
" alley w. of, alley n. of Grand River to Calumet.....	6	"
Tuscola st., Fourth to Third.....	6	"
" alley s. of, Greenwood to alley w. of Fourth.....	4	"
Twelfth st., 458 ft. s. of to River st.....	4	"
" 17 ft. s. of n. of River to 31 ft. s. of n. of Lafayette.....	8	"
" 36 ft. s. of n. of Howard to 36 ft. s. of n. of Baker.....	8	"
" Baker to Calumet.....	6	"
" Calumet to s. line of Boulevard.....	8	"
" s. line of to 16 ft. s. of n. line of Boulevard.....	10	"
" alley w. of, from 121 ft. s. of to Porter.....	4	"
Twentieth st., Fort to Michigan.....	6	"
Twenty-first st., Fort to Standish.....	4	"
" alley w. of, Brevoort to Webster.....	4	"
Twenty-second st., Fort to Dalselle.....	6	"
Twenty-third st., Fort to Magnolia.....	6	"
" Magnolia to 36 ft. s. of Linden.....	3	"
" 36 ft. s. of Linden to 100 ft. n. of Poplar.....	4	"
" 100 ft. n. of Poplar to Kirby.....	6	"
" Kirby to s. line of McGraw.....	4	"
" s. line of McGraw to Ivy pl.....	6	"
Twenty-fourth st., River st. to Fort.....	4	"
" Fort to Baker.....	6	"
" Baker to s. line of Michigan.....	4	"
" s. line of to 32 ft. n. of Michigan.....	16	"
" 32 ft. n. of to 134 ft. n. of Michigan.....	14	"
" 134 ft. n. of to 192 ft. n. of Michigan.....	20	"
" 192 ft. n. of Michigan to Butternut.....	21	"
" Butternut to Buchanan.....	10	"
" Buchanan to n. line of McGraw.....	4	"
" n. line of McGraw to Choep pl.....	6	"
Twenty-fifth st., Howard to Baker.....	4	"
" Baker to Toledo.....	6	"
" E st. to Michigan.....	4	"
" Michigan to Hancock.....	6	"
" crossing Warren.....	6	"
" 60 ft. s. of Hudson to n. line of McGraw.....	6	"

LOCATION.	DIAM. INCHES.	KIND.
Twenty-sixth st., 213 ft. s. of E st. to 146 ft. s. of Hancock.....	6	iron.
“ 146 ft. s. of to 421 ft. n. of Hancock.....	8	“
“ 421 ft. n. of Hancock to McGraw.....	6	“
Twenty-seventh st., Myrtle to s. line of Buchanan.....	6	“
“ crossing Buchanan.....	8	“
“ n. line of Buchanan to 32 ft. n. of s. of McGraw.....	6	“
Twenty-eighth st., Michigan to 14 ft. n. of Rich.....	6	“
Twenty-ninth st., 565 ft. s. of Michigan to Buchanan.....	6	“
Union st., Fifth to Fourth.....	3	“
Uthes st., McKinstry to Clark.....	4	“
Van Dyke ave., Jefferson to 150 ft. n. of Waterloo.....	8	“
“ 276 ft. s. of n. line of, to n. line of Worcester.....	8	“
“ n. line of Worcester to Mack.....	6	“
“ Mack to n. line of Gratiot.....	8	“
“ Gratiot to Harper.....	6	“
“ Jefferson connecting with 48-inch main 22 ft. of.....	10	“
Vincennes st., McClellan to 172 ft. e. of e. of same.....	6	“
Vine st., crossing e. side of Fifth.....	4	“
“ Fifth to Fourth.....	3	“
Vinewood ave., Fort to Buchanan.....	24	“
“ Buchanan to Merrick.....	10	“
“ Merrick to Grand River.....	8	“
“ Fort to 430 ft. n. of Toledo.....	6	“
“ F st. to Buchanan.....	6	“
“ crossing Vinewood, s. of M. C. R. R. betw. mains, 22 ft. ..	6	“
Virginia ave., Hamilton Boulevard to w. line of Woodward, n. and s. sides, 5 ft. e. of w. line of, to 16-inch main in Woodward.....	4	“
“ 5 ft. e. of w. line of, to 16-inch main in Woodward.....	6	“
Viglar st., Twenty-eighth to Lovett.....	6	“
“ crossing e. side of Scotten.....	6	“
“ La Salle to Vinewood.....	6	“
Wabash ave., n. line of M. C. R. R. to n. line of Ottawa.....	6	“
“ n. line of Ottawa to s. line of Buchanan.....	4	“
“ s. line of Buchanan to s. line of Grand River.....	8	“
“ crossing Grand River.....	6	“
“ n. line of Grand River to 18 ft. s. of s. line of L. S. & M. S. R. R.....	8	“
“ 18 ft. s. of s. of L. S. R. R. to 186 ft. n. of Piquette.....	6	“
“ crossing N. Boulevard.....	6	“
Walbridge st., Baldwin to Van Dyke.....	6	“
Walker st., Atwater to Jefferson.....	4	“
Walnut st., 264 ft. w. of to Van Dyke.....	6	“
Warren ave., w. line of Scotten to Grand River.....	6	“
“ Sixteenth to Fourteenth.....	4	“
“ alley w. of Wabash to Avery.....	4	“
“ Twelfth to 195 ft. w. of (n. side).....	4	“
“ Trumbull to 106 ft. w. of Seventh.....	6	“
“ 106 ft. w. of Seventh to Greenwood.....	4	“
“ Greenwood to Third.....	6	“
“ Third to Cass.....	8	“
“ 6 ft. e. of w. of Cass to 105 ft. e. of Riopelle.....	4	“
“ Warren ct. to w. line of Dubois.....	4	“
“ crossing Dubois 56 ft.....	6	“
“ e. line of Dubois to e. line of Grandy.....	4	“
“ 12 ft. e. of w. of to 10 ft. w. of e. of Jos. Campau.....	6	“
“ crossing Collins.....	6	“
“ w. line of Moran to Detloff ct.....	6	“
“ 2 ft. e. of w. to e. line of Mt. Elliott.....	6	“

LOCATION.	DIAM. INCHES.	KIND.
Warren ave., Helen to 226 ft. e. of same.....	4	iron
Warren ct., 181 ft. s. of to 56 ft. n. of Warren ave.....	4	"
Warnaw pl., 17 ft. e. of Dequindre to St. Aubin.....	6	"
Washington ave., Michigan to State.....	30	"
" Michigan to Park.....	10	"
" alley w. of, from alley s. of State to alley e. of Bagley.	4	"
" alley e. of, from alley s. of State to alley w. of Wood- ward.....	4	"
Waterloo st., Dequindre to Jos. Campan.....	4	"
" Jos. Campan to Burlage pl.....	6	"
" Burlage to Mt. Elliott.....	8	"
" Mt. Elliott to 56 ft. e. of Beaufait.....	4	"
" 56 ft. e. of Beaufait to Bellevue.....	6	"
" Field to Sheridan.....	6	"
" Townsend to Baldwin.....	6	"
Watson st., Woodward to Brush.....	4	"
" Brush to Reservoir.....	24	"
" Dequindre to Chene.....	4	"
Wayne st., s. from Woodbridge 173 ft.....	4	"
" Woodbridge to Michigan.....	6	"
Webster pl., Twenty-second to alley e. of same.....	6	"
" Nineteenth to alley w. of Eighteenth.....	4	"
Webb ave., e. line of Hamilton Boulevard to w. line of Woodward.....	4	"
" w. line of Woodward to 16-in. main.....	6	"
Weich ave., Plumer to s. line of M. C. R. R.....	6	"
" 211 ft. s. of to 309 ft. n. of Stark.....	6	"
" s. line of Ingersoll to n. of city limits.....	6	"
Weason ave., Toledo to Herbert.....	6	"
West Boulevard, (both sides), Fort to Shady lane.....	4	"
" (w. side), Shady lane to Baker.....	3	"
" (w. side), n. line of Dix to n. line of Toledo.....	4	"
" (w. side), E. st. to 444 ft. s. of Michigan.....	6	"
" (w. side), 444 ft. s. of to s. line of Michigan.....	4	"
" (w. side), crossing Michigan.....	6	"
" (w. side), Michigan to Myrtle.....	6	"
" (e. side), Baker to 196 ft. n. of Toledo.....	6	"
Western Hay Market, 171 ft. w. of to Trumbull.....	3	"
Westminster ave., 16-in. main to 1,222 ft. e. of Woodward.....	6	"
Whipple st., Baldwin to Van Dyke.....	4	"
Whiting ave., Jos. Campan to 1,860 ft. e. of same.....	4	"
Widman pl., Harper to Milwaukee.....	6	"
Wight st., Chene to McDougall.....	4	"
" McDougall to Mt. Elliott, w. line of.....	10	"
" w. line of Mt. Elliott to 110 ft. e. of Meldrum.....	6	"
" alley s. of, from McDougall to 230 ft. e. of same.....	4	"
Wilcox st., Woodward to Miami.....	12	"
Wilkins st., Brush to Russell.....	4	"
" 136 ft. w. of Nipelle to Orleans.....	4	"
" Orleans to 30-in. main in Chene.....	8	"
Willard st., Van Dyke to 235 ft. e. of same.....	4	"
Williams ave., Michigan to Hancock.....	6	"
" crossing Warren.....	6	"
" Merrick to Hudson.....	6	"
" Stanley to McGraw.....	6	"
Willis ave., crossing e. side of Twelfth.....	4	"
" e. line of Twelfth to Avery.....	6	"
" Eighth to Sixth.....	4	"

LOCATION.	DIAM. INCHES.	KIND.
Willis ave., Greenwood to Fourth.....	4	iron.
" Fourth to Woodward.....	6	"
" Woodward to Beaubien.....	4	"
" Beaubien to St. Antoine.....	3	"
" St. Antoine to Hastings.	6	"
" Hastings to 356 ft. e. of same.....	4	"
" 356 ft. e. of Hastings to Rivard.....	3	"
" Rivard to Russell.....	6	"
" Russell to e. line of Chene	4	"
" e. line of Chene to Grandy.....	3	"
" Jos. Campau to Collins.	6	"
" Collins to 146 ft. e. of same.....	4	"
" crossing Moran, w. side.....	6	"
" Moran to alley w. of Mt. Elliott.....	4	"
" alley s. of, from 20 ft. n. of s. of Willis to alley w. of Avery..	4	"
Winder st., Woodward to w. line of Beaubien.....	4	"
" crossing Beaubien.....	6	"
" e. line of Beaubien to Orleans.....	4	"
Wing pl., Nineteenth to alley w. of Eighteenth.....	4	"
Winslow ave., Grand River to 85 ft. n. of same.....	4	"
" 85 ft. n. of Grand River to McGraw.....	6	"
Winter st., Dequindre to 431 ft. e. of same.....	4	"
Witherell st., Woodward to Miami.....	16	"
" Woodward to Miami	6	"
" Miami to Adams.....	4	"
" Adams to alley s. of Elizabeth.....	3	"
" alley s. of Elizabeth to Columbia.....	6	"
Wolff st., Scotten to 357 ft. e. of same.....	4	"
Woodbridge st., Second to First.....	6	"
" First to Griswold.....	4	"
" Griswold to 24 ft. e. of w. of Woodward.....	6	"
" 24 ft. e. of w. of Woodward to 6 ft. e. of e. line of St. Antoine.....	8	"
" 6 ft. e. of e. of St. Antoine to Dubois.....	6	"
" 300 ft. w. of to Jos. Campau.....	6	"
" Joseph Campau to 400 ft. e. of same.....	4	"
" 400 ft. e. of Jos. Campau to McDougall.....	6	"
" 325 ft. w. of to Leib.....	4	"
" alley s. of, Bates to Randolph.....	4	"
" alley s. of, Brush to 210 ft. e. of Beaubien.....	4	"
" alley s. of, McDougall to Walker.....	4	"
Woodland ave., 16-in. main to e. line of Woodward.....	6	"
" e. line to 780 ft. e. of Woodward.....	4	"
Woodward ave., (e. side), s. from Atwater 246 ft.....	3	"
" (e. side), Milwaukee to 102 ft. s. of N. Boulevard.....	6	"
" (e. side), 102 ft. s. of to N. Boulevard.....	4	"
" (e. side), crossing s. side Melbourne.....	6	"
" (e. side), crossing Chicago Boulevard.....	6	"
" (e. side), crossing Boston Boulevard.....	6	"
" (w. side), s. from Atwater 171 ft.....	4	"
" (w. side), crossing Virginia ave.....	6	"
" (w. side), crossing Shakespeare Boulevard.....	6	"
" (w. side), crossing Schiller Boulevard.....	6	"
" Atwater to Jefferson.....	16	"
" Jefferson to Soldiers' Monument.....	24	"
" Bagg to Edmund.....	24	"
" Atwater to Adams.....	8	"

LOCATION.		DIAM. INCHES.	KIND.
Woodward ave., Adams to Baltimore		10	iron.
" Baltimore to Clay.....		8	"
" N. Boulevard to Woodland.....		16	"
" Woodland to 15 ft. n. of city limits.....		12	"
" High to 300 ft. n. of Canfield.....		4	"
" alley e. of, alley s. of Atwater to alley s. of Jefferson..		4	"
" alley e. of, alley s. of Larned to alley s. of Cadillac sq..		4	"
" alley e. of, alley s. of to Gratiot		6	"
" alley e. of, Gratiot to 12 ft. s. of n. of John R		8	"
" alley e. of, 12 ft. s. of n. of John R. to 173 ft. s. of Witherell		6	"
" alley e. of, (private alley), 80 ft. s. of to Witherell, 97 ft.		3	"
" alley e. of, alley s. of Elizabeth to s. line of Elizabeth..		3	"
" alley e. of, crossing s. side of Elizabeth.....		4	"
" alley e. of, Elizabeth to Columbia.....		6	"
" alley e. of, Columbia to Montcalm.....		4	"
" alley w. of, Atwater to alley s. of Jefferson.....		4	"
" alley w. of, alley s. of to Larned.		4	"
" alley w. of, Larned to Congress.....		8	"
" alley w. of, Congress to alley s. of Fort.....		4	"
" alley w. of, alley s. of State to alley e. of Washington...		4	"
" alley w. of, Montcalm to High.....		3	"
Woodward ave. terrace, Woodward to w. line of John R.....		4	"
Wreford pl., crossing w. side of Vinewood.....		6	"
" crossing Hubbard Boulevard		6	"
Wreford ave., Grand River to Eighteenth.....		4	"
Zender pl., Ellery to 296 ft. e. of same.....		6	"
" 296 ft. e. of Ellery to Mt. Elliott.....		4	"

FORTY-FOURTH

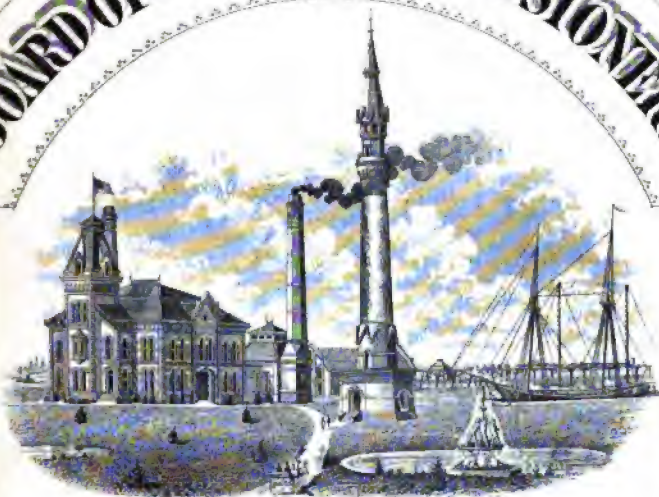
ANNUAL

REPORT

OF THE

BOARD

BOARD OF WATER COMMISSIONERS



NEW YORK WORKS.

TO THE

COMMON COUNCIL OF THE CITY OF DETROIT

FOR THE YEAR

1895.

Mich



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FORTY-FOURTH ANNUAL REPORT

OF THE

Board of Water Commissioners

TO THE

COMMON COUNCIL OF THE CITY OF DETROIT,

TOGETHER WITH THE

REPORTS OF THE OFFICERS OF THE BOARD

FOR THE YEAR 1895.

DETROIT.

THE DETROIT FREE PRESS PRINTING COMPANY.

1896.

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BOARD OF WATER COMMISSIONERS.

DETROIT, 1895 - 96.

MEMBERS:

FRANK E. KIRBY, 1896. ALBERT L. STEPHENS, 1897.
DEWITT H. MORELAND, 1898. EDWARD W. PENDLETON, 1899.
DARIUS D. THORP, 1900.

COMMITTEES:

WAYS AND MEANS.....	Commissioners PENDLETON, STEPHENS.
EXTENSION AND CON- STRUCTION.....	} Commissioners MORELAND, PENDLETON.
PUMPING WORKS.....	
SUPPLIES.....	Commissioners STEPHENS, THORP.
	Commissioners THORP. MORELAND.

OFFICERS:

PRESIDENT	FRANK E. KIRBY.
VICE-PRESIDENT.....	ALBERT L. STEPHENS.
GENERAL SUPERINTENDENT	} L. N. CASE.
SECRETARY	
CIVIL ENGINEER.....	G. S. WILLIAMS.
SUPT. OF EXTENSION.....	HENRY BRIDGE.
SUPT. OF METERS AND INSPECTION	THOMAS R. PUTNAM.
SUPT. OF GROUNDS.....	E. A. SCRIBNER.
CHIEF ENGINEER AT PUMPING WORKS....	URIAH GOULD.
CONSULTING ENGINEER " "	JOHN E. EDWARDS.
METER CLERK.....	HARRY S. STARKEY.
	FRED. H. HUTAFF.
	W. W. WILCOX.
	JOHN J. ROBINSON.
ASSESSORS AND COLLECTORS	PETER J. BECKER.
	THOS. W. GOODALE.
	ANTHONY VOGEL.
	CHARLES J. PATERSON.
	GEORGE A. WINSLOW.
RECEIVING CLERK.....	GEORGE E. KUNZE.
PERMIT CLERK.....	JOHN E. LONG.
PURCHASING AGENT.....	THOMAS E. LYNCH.
AUDITOR.....	J. A. M. MORETON.

DETROIT WATER WORKS.

METER RATES.

First 3,000 Cubic Feet, each month, each 100 gallons.....	$\frac{3}{4}$ of a cent.
All over, each 100 gallons.....	$\frac{1}{2}$ of a cent

ASSESSMENT RATES.

FROM JULY 1st, 1886.

PER ARDUM

For Family, household purposes.....	\$5 00
Each Additional Family in same house, supplied with one faucet..	3 00
Green Houses.—Special rates.	
Private Stables, for each horse.....	2 00
Livery Stables, " " ".....	2 00
Dray and Team Horses, each.....	1 00
Cows, each.....	1 00
Stores and Offices.....	\$2 00 to 30 00
Bakeries, average daily use, for each barrel of flour.....	2 50
Saloons, Groceries and Provision Stores, from.....	\$3 00 to 100 00
Bar, with faucet, from.....	8 00 to 50 00
Fish Houses.....	10 00 to 100 00
Slaughter Houses.—Special rates.	
Hotels and Taverns, in addition to family rate, each room.....	1 00
Boarding Schools, each room.....	1 00
Public Schools, from.....	\$5 00 to 30 00
Building Purposes, each 1 M brick.....	5
" " " 100 yards plastering.....	10
" " " perch stone.....	1½
Printing Offices.—Special rates.	
Butcher Stalls, each not less than.....	3 00
Workshops, for 10 persons or under.....	3 00
" for each additional 10 persons.....	1 00
Estimated quantities of water each 100 gallons.....	2
Boarding Houses, in addition to family rate, each boarder.....	1 00

FIXTURES.

Bath Tubs , for families, 1st tub, \$2; each additional	\$1 00
Bath Tubs , public, each tub.....	5 00
Water-closets , for a family, 1st closet, \$5 00; each additional, \$1 00	\$3 00 to 15 00
Water-closets , for Hotels, Stores, Factories, etc., for ten persons, \$5 00; each additional person.....	25
Red Water-closets , not less than.....	6 00
Urinals , not less than.....	2 00
Wash-Hand Basins , for family.....	\$1 00 to 1 00
" " " for other purposes, each person	25
Permanent Wash Tubs	No Charge
Hose , for lawn and street sprinkling purposes	free
Hose , for other purposes.....	\$4 00 to 30 00
Fountains	5 00 to 30 00
Street Sprinklers , each wagon	15 00

Where there is a waste of water a proper increase of rates will be made.

REPORT
OF THE
BOARD OF WATER COMMISSIONERS
OF THE
CITY OF DETROIT.

To the Honorable the Common Council of the City of Detroit:

Gentlemen—The Board of Water Commissioners of the City of Detroit, in compliance with a time-honored custom, respectfully submit herewith a report for the year ending December 31st, 1895.

The extent and importance of the affairs under the management of this Board have required a subdivision and classification of the work, with corresponding heads of departments. These executive officers each year furnish detailed reports, which it is hoped your honorable body will find time to examine. Besides the important report of the General Superintendent and Secretary, carefully prepared statements are submitted by the Civil Engineer, the Superintendent of Gates, the Superintendent of Meters and Inspection, the Chief Engineer at the pumping station, the Superintendent of Grounds, and the Superintendent of Extensions.

A number of extraordinary improvements during the past year require special mention. The most important of these is the construction of a forty-two-inch main, extending from the pumping station in a direct line to Chene street, a distance of 14,000 feet. This main, while largely increasing

the supply, will reinforce the pressure of the entire system. Though practically completed, it will not be put into operation until the close of the winter season. The cost of this improvement has been the sum of \$180,000. To aid in meeting this expense bonds were issued, as authorized under the act of 1873, in the sum of \$100,000. These bonds are payable in 1925, bearing 4 per cent. interest in gold. The premium obtained upon the sale of these bonds was the sum of \$11,100, which reduces the interest from 4 per cent. to 3½ per cent. The balance of \$80,000 required for this main has been met from the general income.

The new Allis pumping engine has been accepted, after a thorough examination and test by experts, and the contract for roofing the engine house with tile has also been finished. Another important piece of work at the pumping station, which was both begun and completed this past season, is the new embankment between the settling basin and the canal. The amounts paid for the balance due upon last year's contracts and the work of this year at the pumping station amount to the sum of \$35,000.

The rapid growth of the city and the additional burdens placed upon the pumping department will require constant expansion in the facilities for meeting these demands, and we are compelled to pass over to the coming year obligations for about \$30,000 for four new boilers which are to be purchased, and for the necessary apparatus for handling and carrying coal.

A bronze bust of the late Chauncey Hurlbut has been mounted upon an Aberdeen granite pedestal in the memorial gateway. It is fitting that we should gratefully acknowledge the valuable services of Mr. Hurlbut while living and the provision that he has made for a perpetual beneficence. His will equally provides for two objects: the care and improvement of the grounds, and also the maintenance of a library. It is hoped that some arrangement may be consummated by which a branch of the Public Library shall be established at the Park. Many of the larger cities

are maintaining branch libraries, giving remote sections convenient opportunities of drawing books from the Public Library. The attractive features of this park and the rapid increase in population in its vicinity give a most favorable opportunity to introduce this method in our city.

We desire to call special attention of your honorable body to the efforts of this Board made during the past year to obtain the passage of a bill in the Legislature providing for the payment of new pipe by abutting property. This bill passed the House, but not the Senate. Under the present system, a large amount of pipe has been laid which is not used by the property through which it extends, and this expense has been unfairly borne by the general consumer. Whatever other methods may be adopted in the future relative to the supply of water, it is hoped that the abutting property act, at the next session of the Legislature, will pass the barriers of both Houses and receive the signature of the Executive.

The Board desire to encourage a wholesome interest in the quality as well as in the quantity of the liquid which it is its province to furnish. The Board of Health and the medical profession should bear a responsibility for the healthfulness of the water supply, and this Board will welcome any information or enlightenment relative to these important matters. Physicians agree, so far as they are agreed upon any one thing, that typhoid is an indication of unwholesome water, while diphtheria is attributed to defective sewerage. Statistics, covering a series of years, show that Detroit has suffered least from Typhoid of any of the lake cities, while Chicago and Toronto have suffered most. The reverse is true of diphtheria, Detroit leading the list. There is nothing in the location of Detroit to prevent its being most healthful. The cities of Holland, notwithstanding the disadvantage of a moist and swampy territory, enjoy the greatest freedom from disease. With extraordinary difficulties in the way of thorough drainage and a satisfactory supply of water, Amsterdam, Rotterdam and The Hague, by sani-

tary science and enlightened municipal administration, have become model cities of the world in cleanliness and health.

Comparison with other cities places Detroit in the front rank as to its methods and facilities in the supply of water, and, with only one or two exceptions, where the supply is furnished by gravity, our rates are the lowest in the country. Untrammelled by traditions or prejudices, we stand ready to adopt any methods that, after careful examination, are proven for the greater benefit of the people.

In respectfully submitting the foregoing report, we desire to express our appreciation of the uniform courtesy which has been extended by your honorable body to this Board, and for the existing friendly relations.

FRANK E. KIRBY,
ALBERT L. STEPHENS,
DEWITT H. MORELAND,
EDWARD W. PENDLETON,
DARIUS D. THORP.

Board of Water Commissioners of the City of Detroit,
January 2, 1896.

REPORT

OF THE

GENERAL SUPERINTENDENT AND SECRETARY.

January 2d, 1896.

To the Board of Water Commissioners:

Gentlemen—I respectfully submit my report of the general construction and operation of the Works for the year 1895, together with a financial statement of the receipts and disbursements of the Board during the same period.

The disbursements amounted to \$645,829.15, and the receipts to \$651,545.74.

Included in the disbursements are \$50,000 of bonds redeemed in February, and \$173,055.77 paid, up to January 1st, for the laying of the new forty-two-inch force main, also the sum of \$26,442, charged to pumping works, all of which was expended in completing the contracts for the new engine, engine house, etc., and the removal of the dock between the settling basin and the canal and the substitution therefor of an earth embankment.

Taking the sum of these expenditures, \$249,498.12, which are plainly of an extraordinary nature, from the total expenditures, and we have \$396,331.03, which represents the expenditures for operation and maintenance and for what may be called ordinary extensions and construction.

Included in the receipts are \$100,000 of bonds, sold by the Board, and \$12,062.43 premium received thereon. Deducting the sum of these two amounts from the total receipts, and we have \$539,483.31, which represents the receipts of the Board from the ordinary resources, and which are in excess of its ordinary expenditures by \$143,152.28.

Considering the fact that there are on hand about 1,300 tons of iron pipe, which will so far reduce the expenses for ordinary extensions the coming season, and considering also the fact that the Board has about 3,500 tons of "steam-boat" coal, which it can utilize either by its sale or by burning it with an equal quantity of slack, I think the Board can safely calculate upon having for the year 1896 a sufficiently large revenue to meet all of its obligations.

The bonds falling due in the immediate future are \$50,000 December 1st of this year and \$100,000 April 1st, 1897. The next bonds coming due thereafter are \$100,000 September 1st, 1898.

IRON PIPE DEPARTMENT.

The expenditures of this department, including the \$75,000 for forty-two-inch force main, was \$336,880.59. In addition of this new force main, the pipe system and distribution is so complete that it will need but a small expenditure the ensuing year. During the year the ordinary extensions, consisting of six-inch, eight-inch, ten-inch and twelve-inch pipe, amounted to 1,890 tons. There is on hand at the present time of these sizes 1,750 tons, and if extensions in 1896 compare, as I think they will, with those of 1895, possibly 1,000 tons would satisfy our requirements. Certainly the estimate made in December of 1,750 tons will be ample.

The keeper of the storage grounds reports to me the saving during the year, made by the Board doing its own hauling, to be \$3,698.57. This is arrived at on the basis of the contract for hauling in 1894, and by estimating the expense of feeding and shoeing each horse to be \$12 per month.

The Superintendent of Extensions reports to me, upon the completion of each extension, the entire cost thereof in detail, from which reports I am satisfied that notwithstanding the fact that the Board established eight hours to be a day's work, paying the common laborer therefor \$1.50, that the expense of laying pipe has not been materially increased on

that account. To the fact that the Board employed many men who were really unfit to perform hard labor, but who were citizens in actual need and who could not be refused, may be ascribed any increase over what is usually considered an economical cost.

Connected with this department is the gang of men that was organized in August of 1894 under the charge of John Bridge, which was to have entire charge and control of the valves of the system, and whose duties were to make a systematic examination thereof, to repair valves that were found out of order and to attend to their operation whenever the exigencies of the service might require.

There are about 6,000 gates or valves in the system, and their condition and the frequent breakages that occurred proved that, although they are not of as delicate workmanship as a watch, yet it is almost as necessary in operating them that the men doing so must be as skilled in their workmanship and how to handle them as the watchmaker is of the watch he is repairing.

An examination of their work during the past year will be of interest, and shows how necessary it is to the well-being of our pipe system. It is as follows:

5,128 valves were examined.

671 were found out of order.

623 were repaired.

94 were found shut and opened.

331 were fitted with larger heads to stem.

172 new valves were opened.

59 gate wells were built.

234 wells were rebuilt or readjusted.

147 wells were cleaned.

237 wells were repaired.

170 wood boxes replaced with iron boxes.

31 iron boxes were repaired.

387 boxes were readjusted on account of paving.

1,768 gates were shut and opened for various purposes.

40 blow-offs were repaired.

841 gate wells cleaned of ice and snow.

PUMPING WORKS.

It is with considerable pleasure that I reflect upon the changes made by the Board at the pumping works the past year, more particularly the removal of the fence around the basin, and the substitution for the wood dock between the basin and the canal of an earth embankment. Neither the fence nor the dock were useful or ornamental and it has been my wish for years that they should be done away with.

The abandonment of the stand-pipe and the substitution thereof of relief valves was another step in the right direction and when we consider how much more efficiently these simple and cheap mechanical contrivances answer the purposes for which the stand-pipe and tower were constructed, we can see why it was not thought of before.

As our attention has been given, in some measure, to the subject of the fuel used at the pumping works, it was because it was estimated that a considerable saving could be effected in this direction that oil was substituted for coal in 1892.

Since the re-establishment of the settling basin almost directly under the smoke-stack, the Board was obliged to burn coal for years as a matter of cleanliness. The saving made by the burning of oil as a fuel, as compared to the expense in previous years with coal, will be seen by the following table, and which amounted to over \$1,000 per year.

FUEL AT PUMPING WORKS.

BOARD OF WATER COMMISSIONERS.

13

YEARS.	GALLONS PUMPED.	COAL.		COKE.		COST.		GAS.	OIL.		TOTAL COST.	COST PER MILLION OF WATER.	REMARKS.
		POUNDS.	COST.	POUNDS.	COST.	COAL PER TON	OIL, PER GALLON.		COST.	GALLONS PER MILLION WATER.			
1887..	13,108,895,808	16,189,641	\$35,773 05			\$4 40					\$35,773 05 \$2.71%		.....
1888..	14,380,166,670	17,568,850	39,340 81			4 47					39,340 81 2.73%		{ As compared with 1887, \$2.89% As compared with 1884, \$3.03. As compared with 1885, \$3.25%.
1889..	12,875,351,453	14,432,128	31,861 22	1,691,790	\$3,453 05	4 50					34,514 27 2.68%		.....
1890..	12,120,944,532	15,233,740	31,763 40			4 17					31,763 40 2.63		.....
1891..	12,057,261,236	2,367,245	5,029 19					\$28,705 58			33,734 77 2.79		Gas and oil.
1892..	12,270,612,482	2,624,288	5,310 00				1.50 cts.	18,217 18	500,225	\$7,503 82	31,031 00 2.52%		Oil and gas.
1893..	13,877,977,208						1.52%		1,712,720	\$7,479 93	125 27,479 93 1.96		{ Pressure increased over "Coal years," 7 per cent.
1894..	13,640,779,605						1.55 "		1,856,361	\$9,283 47	136 29,283 47 2.14%		{ Pressure increased over "Coal years," 12% per cent.
1895..	14,603,461,954						{ 1.61 "crude" 1.55 "fuel" 2.18 "crude" }		1,920,143	\$2,095 14	131 32,095 14 2.18%		{ Pressure increased over "Coal years," 20% per cent.

SAVING BY BURNING OIL,

1892..	Estimated	\$3,075 89
1893..	Actual	12,303 59
1894..	"	12,075 36
1895..	"	15,792 42
		<u>\$48,247 26</u>

The saving effected the past year, as shown by the table, exceeded that of the previous two years by about 25 per cent and is due to the economy of the new engine and to the charges made by Chief Engineer Gould in the arrangement of the pumps in the old engines.

The price of oil, as will be seen in the table, was 1.50 cents per gallon in 1892, 1.52½ cents in 1893, 1.55 cents in 1894, 2.01 cents the first nine months in 1895, and 2.18 cents from October 1st. Our present contract, running from October 1st to April next, is at the latter figure, at which the cost of pumping water is about the same as with hard coal, less the cost of handling the latter. This is shown in the following table:

FUEL AT PUMPING WORKS, 1895

MONTHS.	GALLONS OF WATER PUMPED.	OIL CONSUMED.		PER MILLION GALS. WATER.		Per ct. of Water Pumped by No. 4 Engine.	HEAD PUMPING AGAINST.	REMARKS.
		GALLONS.	COST PER GALLON.	TOTAL COST.	OIL, GALS.			
January.....	1,272,369,702	171,717	1.55 cts	\$2,661.61	{1344 Average, 137.7	42.	49 $\frac{5}{16}$ lbs.	Crude Oil.
February.....	1,432,362,622	195,249	1.61 "	3,133.00	1364	23.	54 $\frac{5}{16}$ "	
March.....	1,389,893,894	191,586	1.61 "	3,084.53	1374	10.	51 $\frac{1}{16}$ "	
April.....	1,121,489,562	160,284	1.61 "	2,580.71	142 $\frac{1}{16}$	.....	49 $\frac{5}{16}$ "	Commenced Fuel Oil May 25.
May.....	1,186,362,906	158,730	1.61 "	2,533.65	133 $\frac{1}{16}$	.....	49 $\frac{1}{16}$ "	
June.....	1,362,447,460	171,273	1.55 "	2,654.73	{1254 Average, 123.4	23.	54 "	Fuel Oil.
July.....	1,357,033,857	172,936	1.55 "	2,680.51	127 $\frac{1}{16}$	17.	50 $\frac{1}{16}$ "	
August.....	1,257,224,811	150,294	1.55 "	2,329.56	1194	35.	50 $\frac{1}{16}$ "	
September...	1,213,320,237	156,177	1.55 "	2,430.74	{1284 Average, 123.4	09.	50 $\frac{1}{16}$ "	Commenced Crude again Oct 26.
October.....	1,072,860,102	145,410	{1.55 " 2.18 }	2,446.48	1354	.....	49 "	
November...	959,152,569	119,620	2.18 "	2,607.72	{1244 Average, 123.4	46.	47 $\frac{5}{16}$ "	
December....	1,073,934,232	135,867	2.18 "	2,961.90	{1264 Average, 123.4	42	47 $\frac{5}{16}$ "	Crude Oil.
Totals....	14,698,451,954	1,929,807	.....	\$32,095.14	.....	.....	.....	.....

It will be seen by this table that during the first five months of the year "crude" oil was used, with an average of 137 1 10 gallons consumed for each one million gallons of water pumped. In May, at the earnest solicitation of the contractor, and with the knowledge that the works would be benefited thereby, the contract for crude oil at 1.61 cents per gallon to July 1st was vacated and a new contract for "fuel oil" substituted therefor to October 1st at 1.55 cents per gallon. With "fuel" oil during June, July, August and September, one million gallons of water was pumped with an average of 125 2 3 gallons of oil. During the latter part of October and through November and December, "residue" was used, with an average of 125 5 8 gallons of oil for each million gallons of water.

It is true, as the memorial suggested, that the "residue" was not as good as that of "crude," but when the "residue" was used, no new engine was used, considerably less fuel was consumed, and the fact is not lost sight of that the new engine, which was purchased by the Board, was effected about the middle of the year, during the winter months of the year 1884-5, and it is probable that the engine room, the engineer's residence, and the engine house, if it is to be safe to say that there was no change in the fuel used in the two as a fuel.

It is evident, of course, it will be seen that the cost in 1884-5 for pumping one million gallons of water with "fuel" oil at 1.55 cents per gallon, was \$2,758, while at 1.61 cents, which was the price, would have been \$2,062, an increase in the cost of pumping of 33 2 3 per cent.

Considering this fact that at this price as before mentioned, the cost of pumping water with oil was but little less than with hard coal, and with the knowledge that attachments for the almost complete combustion of soft coal had been successfully manufactured, your honorable body determined to have the four new boilers, for some time contemplated, designed and built for the burning of soft coal, screenings or slack, as might prove most advantageous.

It was estimated, with this arrangement, that our fuel

bill, which would amount to over \$40,000 annually with oil at 2.18 cents, would certainly be reduced to \$25,000, if it would not, as some asserted, be reduced one-half.

The Allis engine was given its final test in July. Mr. George H. Barras, of Boston, was employed by the Board to make the test, and July 24th submitted his report, a synopsis of which will be found immediately after the report of Engineer Gould. He reported, in brief, that the efficiency of the engine exceeds the guarantee of the maker, and upon that report it was accepted by the Board.

AMOUNT EXPENDED ON PUMPING WORKS GROUNDS.

ITEMS.	Previously Expended.	1895.	Total.
Land	\$35,000 00	.....	\$35,000 00
Force Mains	624,008 53	.....	624,008 53
Inlet Pipes	90,811 84	.....	90,811 84
Dock, Basin and Canal	137,411 02	\$9,082 58	146,443 60
Conduits and Wells	81,461 70	.....	81,461 70
Engine, Boiler and Coal Houses	192,276 96	4,920 00	197,196 96
Stand Pipe and Tower	30,420 72	.....	30,420 72
Pump Wells	54,221 56	.....	54,221 56
Engines	338,694 74	10,828 63	349,523 37
Boilers	54,711 01	.....	54,711 01
Engineer's House	8,139 75	.....	8,139 75
Sewer	3,666 25	.....	3,666 25
Grounds, Fences and Gate- way	106,240 85	10,110 60	116,350 95
Inspection	2,977 86	.....	2,977 86
Miscellaneous	18,547 67	664 70	14,212 37
Totals	\$1,773,589 96	\$35,556 51	\$1,809,146 47

METERS.

The number of meters attached during the year was 589, making the total in service of 3,775. The report of the Superintendent of that department gives everything concerning the work in detail and contains much that is interesting. He has gleaned certain facts in regard to the death

rate of different cities, which he engrafted in his report, and which are valuable information.

The quantity of water passing through meters is 14 5-10 per cent of the whole quantity pumped, and, with 25 per cent taken off from this whole quantity for that which is used for public purposes, for lawn sprinkling and for leaks in the mains, it is 19 5-20 per cent of the balance, or the usable quantity.

The receipts for metered water during the year were \$89,392.72, or 20 8-10 per cent of the entire water rates, which indicates that but a small fraction of one cent is received by the Board for each 1,000 gallons of metered, more than is received for the unmetered water, and that as close a correspondence is maintained between the two rates as is possible or right.

The question is often asked, is it fair to "A" to place a meter on his premises and require him to pay for every drop he wastes, and for every drop that is wasted by leaking pipes and fixtures, when "B" is not metered and, whether he wastes any or not, pays the same sum the year round. The answer is: It is not fair to "B." "A" belongs to a class of consumers who know every gallon they use, both in living and in business. "B" belongs to a class of whom we know nothing. Each class, as above stated, we receive practically the same sum for each 1,000 gallons. If "A" desires to be careful and economical he can do so and get the entire benefit thereof. If "B" desires to be careful and saving he gets no benefit therefrom and, there being no inducement for economy, he disregards the fact of running streams and leaking fixtures, because they do not, as he thinks, cost him anything. In other words, the unmetered consumers are tied together, each suffering his share of the expense for the carelessness and wastefulness of any one or all of them. The "B's" are becoming aware of this, and are deserting the ranks of the unmetered consumers for

the metered. Five hundred and twenty-nine persons, at their own request, had meters placed on their premises the past year.

EFFECT OF RESTRICTING WASTE.

Inasmuch as it is a fact that water costs directly in proportion to the quantity pumped, and as it is now an admitted fact that running streams do not in the least assist in keeping the sewers clean or in any way effecting the dislodgment of the solid accumulations therein, as has been often claimed, and, further, as there is no other known good purpose that is conserved by supplying a larger quantity than is necessary for the various uses of a community, mechanical, domestic and otherwise, it certainly follows in the interest of economy and good government that the pumping of an excessive amount should be prevented.

Upon this principle the Board in 1889 adopted the policy of introducing meters as rapidly as circumstances would permit, and has pursued the same policy up to the present time.

The following table proves conclusively that where no restrictive measures are used the quantity consumed increases much faster than the population. That this is not due to an increase in the manufacturing interests of the city will appear later on:

rate of different cities, which he engrafted in his report, and which are valuable information.

The quantity of water passing through meters is 14 5-10 per cent of the whole quantity pumped, and, with 25 per cent taken off from this whole quantity for that which is used for public purposes, for lawn sprinkling and for leaks in the mains, it is 19 5-20 per cent of the balance, or the usable quantity.

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Upon this principle the Board in 1889 adopted the policy of introducing meters as rapidly as circumstances would permit, and has pursued the same policy up to the present time.

The following table proves conclusively that where no restrictive measures are used the quantity consumed increases much faster than the population. That this is not due to an increase in the manufacturing interests of the city will appear later on:

HISTORICAL.

YEARS.	Families Supplied.	WATER PUMPED.		REMARKS.
		Total Quantity.	Per Family.	
1852.....	.....	235,840.275	.....
1853.....	4,288	303,531.743	70.868	
1854.....	4,619	376,265.126	81.460	
1855.....	5,282	542,807.364	103.765	
1856.....	5,706	692,124.305	121.297	
1857.....	6,189	697,190.523	112.650	
1858.....	6,474	718,091.207	110.919	
1859.....	6,794	782,112.587	115.118	
1860.....	6,750	870,036.451	125.185	
1861.....	7,128	895,129.423	125.579	
1862.....	7,275	994,945.329	136.762	
1863.....	7,699	1,035,798.043	134.534	
1864.....	7,993	1,019,390.256	127.410	
1865.....	8,351	1,040,514.887	125.675	
1866.....	9,069	1,196,317.922	131.622	
1867.....	10,242	1,425,535.280	139.186	Average per cent. of increase from 1852 to 1866— 12.86.
1868.....	11,544	1,666,545.125	144.364	
1869.....	12,774	1,946,810.325	152.400	
1870.....	13,722	1,866,060.068	136.000	
1871.....	14,896	2,300,150.605	154.414	
1872.....	16,035	2,782,292.578	173.513	
1873.....	17,019	3,198,898.948	187.930	
1874.....	18,858	3,289,872.635	174.511	
1875.....	19,606	4,207,454.260	214.600	
1876.....	20,102	4,065,134.470	200.225	
1877.....	20,345	4,213,339.790	207.090	
1878.....	20,603	4,345,743.330	210.927	
1879.....	21,341	5,129,599.110	240.348	
1880.....	22,465	5,552,965.310	247.188	Average per cent. of increase from 1879 to 1888, in- clusive, 8.5.
1881.....	23,749	6,543,127.968	279.722	
1882.....	25,442	6,284,000.742	243.062	
1883.....	27,415	7,379,327.788	269.170	
1884.....	29,424	8,510,614.140	289.280	
1885.....	30,533	9,970,829.580	326.886	
1886.....	31,946	10,576,571.254	331.070	
1887.....	34,486	13,168,859.808	381.860	
1888.....	36,863	14,280,166.670	390.098	
1889.....	39,158	12,875,334.453	328.890	Commenced Meter ing.
1890.....	41,467	12,120,944.532	292.300	
1891.....	43,933	12,057,261.236	274.470	
1892.....	46,400	12,276,612.482	264.582	
1893.....	49,817	13,877,977.208	278.579	
1894.....	49,912	13,649,779.605	273.476	
1895.....	51,426	14,698,451.954	285.818	

The quantity of water pumped in 1895 was nearly the same as that pumped in 1888, it being but 2 1-5 per cent in advance thereof. The population of the city in 1888 was 194,996 and in 1895 was 266,544, an increase of 36 2-3 per

cent, showing an actual increase in the efficiency of the Works of over 34 per cent, that is, upon the basis of the per capita quantity pumped in 1888.

Consulting the table again, it will be seen, in the column headed "Per Family," that this quantity for each family has continually increased, which is the experience of every city in the world, where no restrictive measures prevail. Had these measures not been adopted in 1889 and continued thereafter it is a fact that this ratio of increase would have continued about the same.

This ratio of increase from 1852 to 1888 was on the average 12 86-100 per cent. The average ratio of increase for ten years previous to 1888 was 8 5-10 per cent. To avoid criticism, I will estimate that this ratio of increase since and from 1888 would have been 7 1-2 per cent. With this ratio of increase the following quantities would have been pumped, and consequently the difference between this estimated quantity and that actually pumped will be the amount saved:

SHOWING SAVING IN COST OF PUMPING.

YEARS.	WOULD HAVE BEEN PUMPED, GALLONS.	WAS PUMPED, GALLONS.	SAVING, GALLONS.	COST PER MILLION GALLONS.	SAVING.	REMARKS.
1898.....	14,880,166,670	The "cost per million gallons" includes the fuel, labor and everything that enters into the pumping of water.
1899.....	15,458,679,170	13,875,334,453	2,583,344,717	\$4 78	\$12,348 36	
1900.....	16,618,080,107	13,120,944,533	4,497,135,575	4 49	20,192 11	
1891.....	17,861,436,114	12,057,361,266	5,807,174,878	4 39 ¹ / ₂	25,493 47	
1892.....	19,201,268,823	12,276,612,482	6,927,656,340	4 27	29,581 06	
1893.....	20,644,598,968	13,877,977,208	6,766,611,775	3 35	23,668 14	
1894.....	22,192,983,161	13,649,779,605	8,543,133,556	3 53	30,071 88	
1895.....	21,857,403,148	14,698,451,934	9,158,951,194	3 53	32,289 50	
					\$173,594 53	

The daily average quantity that would have been pumped in 1895 is 65,362,748 gallons.

The daily average that was pumped is 40,269,731 gallons.

The daily per capita that would have been pumped is 245 gallons.

The daily per capita that was pumped is 151 gallons.

To show that this is not an exaggerated estimate, I submit these facts:

In 1888 the daily per capita of Detroit was 204 gallons, and considerably more than that of Buffalo, in fact it led the world. Last year Buffalo, which has not adopted any restrictive measures, pumped a per capita of 293 gallons; and it is not a stretch of the imagination to say that Detroit would undoubtedly have reached, if not exceeded, that figure had no change been made in the policy of the Board.

With this daily per capita, our daily average would have been 78,097,392, with a maximum, which we must always be prepared to pump, of about 115,000,000, to supply which would require two more engines than we now have and an additional force main.

The only possible criticism that can be made upon this estimate made of the saving in pumping alone, is in the taking the rated cost per million gallons in each of the past years and multiplying the increased pumping by it, because it is true that larger quantities can be supplied at a less cost per unit than smaller quantities. Taking off 15 per cent of the estimated amount in the table would fully cover this difference, leaving a saving of \$150,000.

The entire expenditures for the purchase, placing and repairs of meters from 1889 to 1895 inclusive, was \$133,693.72.

The present valuation of the meters in commission and in stock, with a reasonable percentage off for depreciation occasioned by use, is \$94,289.39, showing that the actual expense for maintaining this department was \$39,404.33 for the seven years.

The saving effected in the cost of pumping is not by any

means the most important one. Large expenditures for machinery, engines, engine houses, force mains, supply mains, etc., etc., have been and always will be prevented by economy of use.

The large force main but now being completed, the new engine, the extension of the engine house, and various other enlargements, were demanded seven years ago. Had not the determination to restrict the waste prevailed with the Board early in the year 1889, these expenditures would have been entered into at that time, and to-day, instead of having a reserve power and capacity more than adequate for our every need, the Board would ere this have entered into another large extension of the Works, in which two engines, an engine house and a force main would have been necessary items.

That the increase in the per capita supply is not due to the increased number of factories and business places in the community, I submit the following table:

YEARS.	No. of Families Supplied.	Rates Received for all Purposes.	Average per Family.	REMARKS.
1876.....	20,103	\$205,624 74	\$10 23	<p>\$10 21 General Average</p>
1877.....	20,345	210,288 12	10 33	
1878.....	20,603	208,193 95	10 10	
1879.....	21,341	218,110 18	10 22	
1880.....	22,465	227,452 73	10 12	
1881.....	23,749	241,884 83	10 18	
1882.....	25,442	261,725 79	10 28	
1883.....	27,415	280,049 06	10 21	
1884.....	29,424	300,467 24	10 21	
1885.....	30,533	313,205 10	10 25	
1886.....	31,946	314,952 31	9 86	<p>Family Rates reduced, taking effect July 1st</p>
1887.....	34,480	322,834 59	9 36	
1888.....	36,863	344,815 26	9 34	
1889.....	39,158	367,925 27	9 39	
1890.....	41,467	387,877 73	9 35	<p>\$9 26 General Average.</p> <p>Hose tax abated, tak- ing effect July 1st Meter rates reduced to $\frac{1}{4}$ of a cent per 100 gallons. Reduction from July 1, 1894, in charges on fixtures.</p>
1891.....	43,933	389,079 97	8 85	
1892.....	46,400	402,534 98	8 67	
1893.....	49,817	420,490 83	8 44	
1894.....	49,912	418,728 76	8 39	
1895.....	51,426	428,772 41	8 34	

For ten years previous to 1886, the rates received for family, business and manufacturing purposes, divided by the number of families supplied, gives practically the same quotient. During that period the same system of rates prevailed. From that time there have been several reductions, all of which, fully applied in 1895, reduced the average received from each family from \$10.25 to \$8.34, a difference of \$1.87, or a general reduction in the income of the Board for the year of \$96,166.62.

Previous to and during the first two years of the introduction of meters the average was to each family \$9.36. The reduction of the rates in 1891 subsequently reduced this average in 1895 to \$8.34, a difference of \$1.02 to each family, or a general reduction of \$52,454.52 in the income of the Board for the year.

I submit the following comparative statement, taking two years previous to the introduction of meters and the last two years. The actual operating expenses were caused by the increased price of oil and the increased number in the clerical force of the Works:

COMPARATIVE STATEMENT.

	1887.	1888.	1894.	1895.
Daily average consumption in gallons	36,079,068	39,397,716	37,396,656	40,269,731
Daily average consumption per capita.....	195	204	144	151
Total annual consumption.....	13,168,859,808	14,388,166,670	13,649,779,606	14,698,451,954
Total consumption through meters.....	65,182,000	91,750,000	1,788,878,000	3,121,843,600
Revenue from unmetered water.....	\$316,316.30	\$335,140.10	\$344,877.69	\$339,379.69
Revenue from metered water..	\$6,518.30	\$9,175.00	\$73,851.07	\$89,892.72
Per 1,000 gallons metered water	.10	.10	.041	.042
Per 1,000 gallons unmetered water.....	.094	.023	.025	.027
Number of families supplied..	34,486	36,863	49,912	51,426
Number of service connections	32,938	36,609	47,559	48,918
Miles of pipe.....	322	325	486	501
Number of meters	About 40	48	3,186	3,775
Actual operating expenses ..	\$69,723.74	\$92,402.54	\$93,025.22	\$107,552.30
*Estimated population.....	184,829	194,996	258,834	266,545

* Population estimated by multiplying families in city by 5.14.

It will be seen that the per capita quantity pumped increased seven (7) gallons over that of 1894. In analyzing this increase I find that during the first six months of the year the per capita was 160 gallons and during the last six months it was but 143 gallons.

This excessive amount in the first half of the year was almost entirely occasioned by the extreme cold weather in January, February and March. The per capita in February was 192 gallons.

It will give some idea of the vast amount that was wasted at that time by comparing it with November, in which the per capita was only 119 gallons. The difference, 73 gallons per capita, or a daily average pumping of nearly twenty millions, was wasted simply to prevent fixtures from freezing.

It will be seen by the table, also, that for each 1,000 gallons of metered water was received 4 2-10 cents, and for each 1,000 gallons of unmetered water was received 2 7-10 cents. Eliminating from the unmetered water the 25 per cent representing the water used for public purposes, in lawn and street sprinkling, etc., which it includes, and the receipts for this usable quantity is 3 8-10 cents, or but four-tenths less than that for metered water.

I desire to call your particular attention to that portion of the Civil Engineer's report in which he treats of the necessity for more restrictive measures to prevent waste, than at present prevail.

His recommendation to purchase ten (10) of the Deacon meters is one of which I most heartily approve. For two or three years past I have been familiar with the benefits to be derived from their use, but several things have conspired to keep me silent on the subject. The condition of our finances, I think, will now permit us to extend our restrictive measures in this direction, an outlay that will eventually save more than ten times the expense.

The Civil Engineer's treatise upon disease organisms, and the possibility of their existence in the water supplied the

city, is of interest to all, and shows a considerable research in a field that is, comparatively speaking, known but little of except by scientists.

While the subject is certainly worthy of consideration, it is yet true that the existence of the evils described is, after all, largely imaginary.

We have a Board of Health in our city whose duties are to regard the public health from every standpoint, to not only guard the city from contagious diseases, but to know their source and cause and to prevent their propagation.

The Board of Water Commissioners has never received from the Board of Health any information, directly or indirectly, that the waters of Detroit River contain germs, either organic or inorganic, that are periling the public health.

I speak of this through a desire to prevent any material expenditure in this direction, unless circumstances demand it.

WATER WORKS BONDS.

The following table gives the entire history of the issue and redemption of the bonds of the Board:

NO. OF ISSUE.	ACT OF	ISSUED.	PAYABLE.	AMOUNT.	RATE OF IN- TEREST.	REDEEMED.	OCC- STANDING
1st	1853	Aug. 1, 1853	Aug. 1, 1858	\$100,000	7cts.	\$100,000	.....
"	"	"	Aug. 1, 1878	100,000	7 "	100,000	.....
"	"	"	Aug. 1, 1873	50,000	7 "	50,000	.....
2nd	1853	Aug. 1, 1855	Aug. 1, 1860	100,000	7 "	100,000	.....
"	"	June 12, 1855	Aug. 1, 1865	100,000	7 "	100,000	.....
"	"	"	Aug. 1, 1860	50,000	7 "	50,000	.....
3rd	1857	Aug. 1, 1858	Aug. 1, 1868	150,000	7 "	150,000	.....
"	"	Aug. 1, 1867	Aug. 1, 1867	100,000	7 "	100,000	.....
4th	1869	Feb. 1, 1870	Feb. 1, 1900	100,000	7 "	.....	100,000
5th	"	Aug. 1, 1872	Aug. 1, 1903	50,000	7 "	.....	50,000
6th	"	Aug. 1, 1873	Aug. 1, 1906	50,000	7 "	.....	50,000
"	1873	Feb. 1, 1874	Feb. 1, 1904	50,000	7 "	9,000	41,000
7th	1869	Aug. 1, 1874	Aug. 1, 1904	50,000	7 "	5,000	44,000
"	1873	"	"	200,000	7 "	.....	200,000
"	"	June 1, 1875	June 1, 1905	150,000	7 "	1,000	149,000
"	"	June 1, 1878	June 1, 1906	200,000	6 "	1,000	199,000
"	"	Sept. 1, 1880	Sept. 1, 1899	100,000	4 "	.....	100,000
"	"	April 1, 1881	April 1, 1897	100,000	4 "	.....	100,000
"	"	Dec. 1, 1881	Dec. 1, 1896	50,000	4 "	.....	50,000
"	"	Jan. 10, 1895	Jan. 10, 1905	100,000	4 "	.....	100,000
				\$1,950,000		\$767,000	\$1,183,000

The following table gives the results obtained from the assessments made last May and June, to commence July 1.

The total number of families in the city was at that time 51,857, which, multiplied by 5.14, the average number in each family, gives a population of 266,544. This average is obtained from the United States census of 1860, 1870, 1880 and 1890.

ASSESSMENT 1895-96.

Dist.	WARDS.	FAMILIES.			Vacant Tenements.	Increase. — Decrease		ASSESSMENT.		
		Supplied.	Not Supplied.	Whole Number.		Increase.	Decrease	1895-96.	Increase. — Decrease	Transferred to Meter Rolla.
1	Ninth.....	5,336	10	5,346	135	199		\$37,874	\$381	\$361
	Fifteenth...	2,800	62	2,862	81	100		18,547	1,570	285
	Totals ...	8,136	72	8,208	216	299		46,421	1,951	646
2	Eleventh...	3,504	7	3,511	145	23		20,459	— 397	948
	Thirteenth..	2,522	18	2,540	71	73		15,004	357	165
	Totals ...	6,026	25	6,051	216	96		35,463	— 30	1,113
3	First.....	2,557	5	2,562	150	64		25,057	— 232	948
	Seventh	3,399	12	3,311	196	64		18,381	— 119	615
	Totals...	5,956	17	5,973	346	128		43,438	— 351	1,563
4	Third.....	3,256	9	3,265	89	49		19,181	— 276	676
	Fifth.....	3,778	12	3,790	100	108		21,484	161	485
	Totals ...	7,034	21	7,055	198	157		40,665	— 115	1,161
5	Second.....	2,041	6	2,047	161	31		24,049	— 460	1,017
	Sixth.....	3,575	6	3,581	188	143		24,488	134	733
	Totals ...	5,616	12	5,628	344	174		48,537	— 326	1,750
6	Tenth.....	4,094	7	4,101	138	58		25,094	507	261
	Fourteenth.	2,304	31	2,335	116	45		13,713	361	104
	Totals ...	6,398	38	6,436	254	103		38,807	868	365
7	Fourth	3,107	3	3,110	187	76		25,255	— 239	125
	Twelfth	3,173	4	3,177	155	104		18,820	768	27
	Totals ...	6,280	7	6,287	342	180		44,075	529	1,042
8	Eighth.....	3,400	3	3,403	157	242		23,008	1,072	414
	Sixteenth...	2,680	236	2,916	128	135		14,863	145	661
	Totals ...	6,080	239	6,319	285	377		37,871	1,217	1,075
	Aggregate	51,496	431	51,927	2,201	1,514		\$335,277	\$3,753	\$3,715

FINANCIAL REPORT

BY THE

SUPERINTENDENT AND SECRETARY

FOR THE YEAR 1895.

RECEIPTS.

Water Rates Account.—	
Rates paid	\$ 428,772 41
Percentage Account.—	
From delinquents	7,633 01
Penalties for shutting off.....	440 00
Plumbers' License Account.—	
Paid for licenses.....	550 45
Service Connections Account.—	
Labor and material.....	5,404 07
City of Detroit Account.—	
Tax levy	73,201 00
Repairing Leaks Account.—	
Labor	180 41
Office Account.—	
Rebate	1 93
Iron Pipe Account.—	
Labor and materials.....	12,130 68
Bonus paid for extensions.....	1,776 43
Hurlbut Fund Account. -	
Payments from trustees.....	4,000 00
Material sold	1 98
Real Estate Account.—	
Rentals	2,450 00
Meters Account.—	
Sale of material.....	371 79
Interest Account.—	
On deposits general account.....	2,318 17
On deposits sinking fund.....	115 30
Bonus on bonds.....	12,082 43

Bonded Indebtedness account.—	
Bonds sold	\$100 000 00
Horse and Wagon Account.—	
Sale of horses	75 00
Pumping Works Account.—	
Material sold	10 00
Pumping Water Account.—	
Ice and material	40 85
Total receipts	<u>\$651,545 74</u>

EXPENDITURES.

FOR CONSTRUCTION.

Iron Pipe Account.—	
Superintendent and clerks	\$ 12,076 57
Labor	140,424 61
Iron pipe	121,624 90
Special castings	11,543 97
Tools and repairing of	2,347 67
Derrick charges	382 30
Lumber	2,718 21
Coal	374 84
Hauling	211 67
Oil	119 00
Packing	465 55
Shortage on pay roll	1 00
Pumps and furnaces	231 79
Lead	6,140 87
Paint, etc.	270 79
Repairs and material for	462 78
Repaving	9,118 09
Street car and toll tickets	377 00
Livery	97 00
Wagon and harness supplies and repairs	637 60
Feed	2,677 54
New track and repairing	437 58
Farrier	474 27
Materials	2,076 97
Stationery, books, etc.	254 86
Medical services	255 00
Horse board	158 50
Shavings	148 90
Fine	2 00
Veterinary services	201 65
Valves	13,433 03
Freight, express and telegrams	30 70

Gate wells and boxes.....	\$4,724 35
Typewriting	6 25
Real estate (let)	775 00
Painting and papering house.....	45 00
Refund	241 00
Funeral expenses	97 00
Gravel	190 50
Beams	274 08
Stove, etc.....	8 31
Lot privileges	201 00
Claims for injury.....	250 00
Resodding	3 00
Gutters, etc.....	46 40
Bicycle	75 00
	<hr/>
	\$335,714 10

Pumping Works Account.—

Labor	\$ 906 44
Supplies—Matches, soap, etc.....	12 50
Materials	380 45
Tile roof	4,020 00
Machines and repairs	876 91
Payments on engine.....	8,000 00
Dock and embankment.....	9,032 58
Indicator gear	25 00
Testing engine	1,126 32
Changing platform	667 90
Rent for steamer Ward.....	250 00
Expenses to Chicago, chief engineer...	21 75
Railings	132 50
	<hr/>
	\$26,442 35

Meter Account.—

Superintendent and labor.....	\$ 6,647 80
Meters	9,235 11
Freight and express.....	53 15
Specials and fittings.....	700 38
Horse board and shoeing	225 25
Repairs to harness and vehicles.....	64 67
Street car and toll tickets.....	10 21
Hauling	21 75
Veterinary services	1 00
Material—Brass, solder, lumber, etc...	306 73
Tools and repairing of.....	10 57
Printing, stationery and postage.....	33 97
Meter wells	191 07
Repairing pavement	16 22
	<hr/>
	\$17,587 85

Real Estate Revenue and Expense Account.—

Insurance	\$ 200 81
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BOARD OF WATER COMMISSIONERS.

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Repairing sidewalk	\$ 83 74	
Plumbing	125 00	
Replastering in hall.....	13 63	
Labor	165 86	
Material	267 53	
		<u>\$946 57</u>
Real Estate Account.—		
Building shed	\$ 458 00	
Improvements at storage yard.....	2,058 63	
Platform	1,300 00	
Heating apparatus	250 00	
Material	248 16	
		<u>\$4,314 79</u>
Engineering Account.—		
Civil engineer and assistants.....	\$ 7,442 64	
Material, instruments, etc.....	914 79	
		<u>\$8,357 43</u>
Horse and Wagon Account.—		
Horses	\$ 790 00	
Harness	180 00	
Vehicles and parts thereof.....	1,519 00	
		<u>\$2,489 00</u>
Office Furniture and Fixture Account.—		
Furniture and fixtures	\$ 1,301 65	
		<u>\$1,301 65</u>
Aggregate		<u>\$398,153 74</u>

· OPERATION AND MAINTENANCE.

Office Account.—		
Secretary, assessors and clerks.....	\$ 25,487 00	
Watchman and janitors.....	1,725 50	
Printing and binding.....	1,172 20	
Advertisements and subscriptions.....	108 58	
Supplies—Soap, matches, etc.....	53 13	
Supplies—Stationery, etc.....	816 51	
Furniture and fixtures	30	
Extra services	903 64	
Fuel	27 10	
Light	394 60	
Postage and telegrams	232 40	
Germicide	18 00	
Ice	17 10	
Street car tickets	40 00	
Horse board	195 00	
Farrier ..	34 35	
Harness and buggy repairs	13 00	
Horse, harness and wagon supplies...	17 25	

Express charges	\$ 1 05	
Livery	11 25	
Entry fee	8 00	
Safe rental	10 00	
Veterinary services	2 00	
Telephone rent	709 92	
Premium on guaranty.....	402 50	
Electric light repairs	5 05	
Entertaining Columbus visitors.....	127 50	
Insurance, boiler	90 00	
Fees	6 00	
		<hr/> \$32,628 93
Pumping Water Account.—		
Engineers and firemen	\$ 16,625 57	
Consulting engineer	1,140 00	
Fuel oil	32,652 21	
Coal	68 97	
Stationery	18 29	
Supplies—Rags, waste, soap, etc.....	158 61	
Supplies—Valves, gaskets, packing, etc.	327 49	
Boiler and machine repairs.....	612 75	
Lubricants	484 97	
Horse goods	2 85	
Farrier	8 00	
Commutator	35 00	
Street car tickets	10 00	
Boiler inspection	54 50	
Demurrage	2 00	
Frames	23 00	
Electric light repairs.....	66 17	
Freight and telegrams.....	4 36	
Ice	37 04	
		<hr/> \$52,331 78
Water Rates Account.—		
Overcharge returned	\$ 12 25	
		<hr/> \$12 25
Percentage Account.—		
Labor	\$ 2,508 00	
		<hr/> \$2,508 00
Repairing Leaks Account.—		
Labor	\$ 11,530 42	
Wagon and harness repairs.....	84 03	
Feed, board and supplies.....	31 85	
Farrier	121 25	
Street car and toll tickets.....	69 00	
Repairing tools	35 57	
Tools and materials.....	233 34	
Repairing pavement	263 10	

Telephone rent	\$ 1 25	
Damage by water pipe.....	250 00	
Meals	3 75	
		<u>\$12,623 56</u>
Service Connections Account.—		
Labor	\$ 7,865 47	
Cart and harness repairs.....	235 55	
Cocks and valves	2,621 18	
Farrier	52 00	
Toll tickets	1 00	
Material and repairs	93 26	
Refund to plumber.....	2 50	
Hospital services	3 00	
Blankets	35 20	
		<u>\$10,909 16</u>
Inspection Account.—		
Labor and material.....	\$ 3,750 00	
		<u>\$3,750 00</u>
Meter Repairs and Expenses Account.—		
Fittings, etc.....	\$ 1,495 58	
		<u>\$1,495 58</u>
Aggregate		<u>\$116,259 26</u>
Bonded Indebtedness Account.—		
Bonds paid	\$ 50,000 00	
		<u>\$50,000 00</u>
Interest Account.—		
Interest paid	\$ 72,301 99	
		<u>\$72,301 99</u>
Hurlbut Fund Account.—		
Superintendent, librarian and labor....	\$ 5,105 58	
Plants, trees, flowers, fertilizers, etc..	51 87	
Tools and material	379 90	
Street car tickets	10 00	
Farrier	6 05	
Plans and specifications	64 78	
Tent	20 00	
Books	40 00	
Memorial gateway (part).....	1,968 30	
Gravel	500 25	
Crushed stone	668 80	
Settees	297 50	
Expenses to Plymouth.....	1 15	
		<u>\$9,114 16</u>

RECAPITULATION.

Construction expenditures	\$398,153 74
Operation and maintenance expenditures.....	116,259 28
Bonded Indebtedness	50,000 00
Interest	72,801 90
Hurlbut fund	9,114 16
Aggregate	<u>\$645,829 15</u>

ACTUAL OPERATION EXPENSES.

The actual operating expenses are the foregoing expenditures for operation, less the credits by cash received for said expenditures, and are as follows:

Office account	\$ 32,628 93	
Less receipts	1 98	
	<u> </u>	\$32,627 00
Pumping water	\$ 52,331 78	
Less receipts	40 85	
	<u> </u>	52,290 93
Repairing leaks	\$ 12,623 56	
Less receipts	180 41	
	<u> </u>	12,443 15
Service connections	\$ 10,900 16	
Less receipts	5,963 62	
	<u> </u>	4,945 64
Inspection		3,750 00
Meter repairs and expense account.....		1,495 58
Total		<u>\$107,552 30</u>

RECEIPTS OF WATER RATES BY DISTRICTS.

YEAR.	1st DISTRICT, WARDS 9 AND 13.	2d DISTRICT, WARDS 11 AND 13.	3d DISTRICT, WARDS 1 AND 7.	4th DISTRICT, WARDS 3 AND 5.	5th DISTRICT, WARDS 2 AND 6.	6th DISTRICT, WARDS 10 AND 14.	7th DISTRICT, WARDS 4 AND 12.	8th DISTRICT, WARDS 8 AND 16.	METERS.	AGGREGATE.
1885-6	..	\$2 50	..	..	..	..	..	..	..	\$2 50
1886-7	..	5 00	..	..	..	..	..	..	..	5 00
1888-9	..	..	..	..	..	..	..	..	..	..
1889-90	..	..	..	..	..	..	..	..	..	..
1890-1	..	..	\$3 50	..	..	..	..	..	..	3 50
1891-2	..	..	..	\$2 50	..	\$2 50	..	..	..	5 00
1892-3	\$13 75	2 50	10 25	2 50	\$6 75	28 25	\$3 75	\$9 00	..	76 75
1893-4	49 35	36 75	96 25	31 75	122 50	104 15	64 42	98 16	..	608 33
1894-5	22,315 27	17,302 78	20,979 58	20,084 04	25,576 65	19,641 51	22,181 00	18,992 13	..	167,022 96
1895-6	24,323 98	18,021 16	21,954 68	20,337 22	23,159 01	19,619 70	22,453 42	19,791 53	*\$59,892 72	261,068 37
Total..	\$46,702 35	\$35,370 69	\$43,044 21	\$40,408 01	\$50,864 91	\$39,306 11	\$44,702 59	\$38,890 83	\$59,892 72	\$428,773 41

* Meter receipts from January 1, 1895, to January 1, 1896.

Without increasing the reduction of the rates which took effect July 1st, 1894, prevailing, of course, the entire year of 1895, the water rates received were in excess of those of 1894 by about \$71,000.

The water rates that will be received in 1896 will probably be in excess of those of 1895 by about \$15,000, should no change be made in the present schedule of rates.

The report, gentlemen, is respectfully submitted, together with a report of the financial operations of the company to the Board, prepared at my request by the Auditor, and which is attached.

Yours, very respectfully,

L. N. CASE,
Superintendent and Secretary.

CERTIFICATE OF AUDITOR.

L. N. CASE, *Superintendent and Secretary*:

Dear Sir—In accordance with your request, I furnish herewith a consolidated statement of the financial operations of the employees of the Water Board for the year 1895.

H. S. STARKEY, METER CLERK.

I have examined the accounts of the Meter Clerk, from January 1st, 1895, to July 1st, 1895. Meter bills amounting to \$41,946.94 were collected and same passed in full to Receiving Clerk.

J. E. LONG, PERMIT CLERK.

The total receipts from service cocks, sleeves, valves and plumbers' licenses, from January 1st to July 1st, 1895, as proven by examination of receipts issued, was.....\$2,731 45

Receipts from delinquent taxes were:

Year.		
1891-2	\$ 2 50	
1892-3	34 75	
1893-4	379 17	
	416 42	
Total		\$3,197 87

The books of the Receiving Clerk show that amount above has been received in full.

ASSESSORS' DISTRICTS 1 TO 8 INCLUSIVE.

In addition to the monthly examination of the receipts of the eight Assessors, the result of which has been reported to the Board, I have made an examination of their assessment books for the year July, 1894, to July, 1895, making a careful analysis of the treatment of every assessment on the books.

I find the work of the Assessors remarkably correct, and furnish below a consolidated report of same.

Assessment 1894-5, Dist. 1 to 8 inclusive..	\$331,524 00	
Gains (increased assessments)	17,727 44	
Cash paid to receiving clerk		\$334,887 67
Losses (assessments reduced)		10,981 27
Delinquent rates		3,381 75
District No. 1—Cash over.....	50	
District No. 2—Cash over.....	3 75	
District No. 3—Cash over.....	50	
District No. 4—Cash short.....		1 25
District No. 5—Cash over.....	50	
District No. 6—Cash short.....		3 00
District No. 7—Cash balanced.....		
District No. 8—Cash short.....		1 75
	<u>\$349,256 69</u>	<u>\$349,256 69</u>

MEMORANDUM.

Three assessors short in cash.....	\$6 00
Four assessors over in cash.....	5 25
Net shortage	75

GEO. E. KUNZE, RECEIVING CLERK.

The total receipts of the Receiving Clerk from all sources for 1895, were as follows:

January, 1895.....	\$ 71,846 50	
February, "	15,118 24	
March "	23,777 31	
April "	177,458 04	
May "	21,002 88	
June, "	25,866 43	
July, "	99,338 36	
August, "	69,425 97	
September, "	28,806 14	
October, "	72,292 92	
November, "	19,891 26	
December, "	26,631 69	
	<u>\$651,545 74</u>	
Cash on hand January 1, 1895.....	5,978 94	
		<u>\$657,524 68</u>

With bank deposits as follows:

January, 1895.....	\$ 68,960 14
February, "	21,812 03
March, "	19,921 06
April, "	173,887 06
May, "	28,000 17

BOARD OF WATER COMMISSIONERS.

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June,	1895.....	\$23,095 45	
July,	"	93,528 87	
August,	"	77,954 98	
September,	"	23,954 67	
October,	"	68,954 98	
November,	"	28,019 18	
December,	"	22,813 25	
		<u>\$650,961 88</u>	
Cash on hand January 1, 1896.....		6,562 80	
		<u>\$657,524 68</u>	

The sources of the foregoing receipts were as follows:

Water rates		\$428,772 41	
Percentage	\$ 7,633 01		
Shuts	440 00		
		<u>8,073 01</u>	
Service connections	\$ 5,102 50		
Service connections (material sold)	301 57		
		<u>\$5,404 07</u>	
Plumbers' license		559 45	
City of Detroit (tax levy)....		73,201 90	
Iron pipe, material sold.....	\$ 10,640 68		
Iron pipe, bonus	3,266 46		
		<u>13,907 14</u>	
Repairing leaks, material sold		180 41	
Pumping water, material sold		40 85	
Meter account, material sold..		371 79	
Real estate, rev. and exp....		2,450 00	
Interest acct. (acct. bank dep.)\$	2,433 47		
Interest acct., bond bonus....	12,062 43		
		<u>14,495 90</u>	
Horse and wagon acct.....		75 00	
Hurlburt fund		4,001 88	
Pumping works, material sold		10 00	
Office acct., rebate.....		1 93	
Bonded indebtedness, bonds sold		<u>100,000 00</u>	
		<u>\$651,545 74</u>	

CASH STATEMENT, YEAR 1895.

1895.	Dr.		
Jan. 1st. Cash on hand	\$ 5,978 94		
Commercial National Bank,			
General Fund	38,922 76		
Commercial National Bank,			
Secretary's Fund	500 00		
Dec. 31st. Receipts 1895	<u>651,545 74</u>		
		<u>\$696,947 44</u>	

1886	Cr.	
Jan. 1st	Cash on hand.....	\$ 6,502 80
	Commercial National Bank.	
	Balance General Fund.....	43,555 49
	Commercial National Bank.	
	Balance Secretary's Fund....	1,000 00
	Disbursements, 1885	645,829 15
		<hr/> \$806,947 44

I certify to the correctness of the Receiving Clerk's accounts, as above.

Disbursements have been made through the Secretary's office as follows:

January, 1885.....	\$ 92,919 05
February, "	41,142 64
March, "	45,634 94
April, "	58,780 30
May, "	70,143 70
June, "	69,721 64
July, "	49,538 19
August, "	57,492 94
September, "	40,965 14
October, "	52,134 20
November, "	29,751 56
December, "	37,725 85
	<hr/> \$645,829 15

The above disbursements were debited to the following ledger accounts:

Iron pipe	\$336,714 10
Meters	17,587 85
Service connections	10,909 16
Engineering	8,357 43
Office	32,628 93
Pumping water	52,331 78
Repairing leaks	12,623 56
Meter repairs and expenses.....	1,495 58
Percentage	2,506 00
Inspection	3,750 00
Hurlburt Fund	9,114 16
Interest	72,901 90
Horse and wagon.....	2,489 00
Office furniture and fixtures.....	1,301 65
Real estate rev. and ex.....	946 57

Real estate	\$ 4,314 79	
Bonds redeemed	50,000 00	
Pumping works	26,442 35	
Water rates (refund)	12 25	
	<hr/>	<hr/>
		\$645,829 15

In connection with the foregoing disbursements, I desire to state that I have made a careful examination of all vouchers, monthly, before the passage of same by your honorable body, and hereby certify to the correctness of the foregoing.

Respectfully submitted,

J. A. M. MORETON,
Auditor.

Detroit, January 2, 1896.

REPORT OF THE CIVIL ENGINEER.

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Detroit, January 25, 1896.

To the Honorable Board of Water Commissioners of the City of Detroit:

Gentlemen—In compliance with the regulations of your honorable body, the Civil Engineer submits the following annual report for the year 1895:

The year just closed has, for several reasons, been a notable one in the history of our Works. Perhaps the event that will be viewed with the most interest by those conversant with the mechanical principles involved in the operation of water works and the hitherto accepted *dicta* regarding them, is the disconnecting of the stand-pipe June 2, thereby leaving this a direct pressure system in the simplest form, without reservoir, stand-pipe or balancing tank, dependent simply upon relief valves for protection against excessive variations of pressure. Ten years ago, and by many even now, such a proceeding would have been looked upon as inviting calamity, yet during the past seven months, under more severe requirements than ever before, the same engines that have served us from ten to twenty years have run on without interruption, and the testimony of their engineers is that even when two engines are running in one main, they operate more smoothly than while the stand-pipe was connected.

The year is further remarkable from the immense quantities of water consumed at various times and for its total consumption, which has exceeded that of any previous year. During 1895 the quantity of water recorded pumped by the engines has been 14,698,451.954 gallons, an increase of nearly 8 per cent over the quantity pumped in 1894. For

the twenty-four hours from 7 a. m., February 8, to 7 a. m., February 9, there was pumped 60,532,971 gallons, which is the largest quantity ever pumped here in the same length of time. On Saturday, July 6, between 5 and 6 p. m., there was pumped 2,981,934 gallons, which is the maximum amount ever pumped in a single hour. The last two statements give a key to the explanation of our increased consumption for the year, and its causes are to be found in the exceptional meteorological conditions which have existed at various times. A careful study of the fluctuations of our water consumption carried on during the past three years has shown certain relations which exist between temperature and precipitation and the demand for water. Briefly, the results of these investigations may be summarized as follows:

For a range of temperature from about the freezing point to about 50 degrees above zero, Fahrenheit, variations of temperature appear to exert no influence upon consumption, but any change above 50 degrees Fahr. will affect consumption, and it will increase rapidly as the temperature rises; and as it falls will decrease more slowly than it increased. Below 32 degrees Fahr. variations of temperature will affect consumption, which increases rapidly as the temperature falls, and decreases less rapidly as it rises, being unlikely to reach the normal until the temperature gets to be somewhat above the freezing point. Above 50 degrees Fahr. precipitation will have a sudden and very marked effect to reduce consumption, having in one instance decreased ours as much as 12,000,000 gallons in a single day, but below 50 degrees Fahr. it appears to exert no influence.

Considering the excessively cold weather of the winter months and the very hot, dry periods of the early summer in view of the above deductions, the addition to our consumption is readily explained. On the other hand, for no month since November, 1892, has so small a quantity of water been pumped as in the November just past, and the hourly records for those periods when our consumption is

least, from midnight to four in the morning, remain at as low a figure as they have been at corresponding times during the past three years.

The small extent of pipe laid of the smaller sizes, twelve-inch and under, also distinguishes this year. While during the four years 1891 to 1894 inclusive the average quantity laid in these sizes has been over 183,000 feet, during 1895 only 96,000 feet were laid; and, finally, the construction of a third force main from the Works to town marks an epoch in the history of our system. This main is now nearing completion, and when in service will contribute materially both to relieve our machinery from the severe strains to which it was subjected by the excessive demands of the past season, and to raise the head in those districts where its service is most needed. It was discovered last July, at the time when our engines were pumping nearly three million gallons per hour, that the frictional loss amounted to 34 per cent of the work done by the engines. When delivering two million gallons per hour the frictional loss was 21.34 per cent. It had already been found that two-thirds of the frictional losses occurred in the two forty-two-inch force mains. Therefore, with the third main in service we may expect that the resistances in the force mains when delivering three million gallons hourly will be the same as at present when delivering two million gallons, or, comparing two-thirds of the above percentages, the new main will reduce our frictional losses from 34.4 per cent to 23.1 per cent of the total work done. This will mean on the average about a three-pound increase of pressure over the entire system, being somewhat more in the eastern part and less in the western.

On the afternoon of July 6, when the maximum quantity of water was pumped, an investigation was made of the condition of the distribution in the district between Canfield avenue and the North Boulevard from Cass avenue west, which district the sixteen-inch main laid in 1894 was intended to relieve. The examination, which extended over

nearly 7,000 feet of territory from south to north, being at right angles to the supposed direction of flow, beginning at a thirty-inch main and terminating at a twenty-four-inch main, including eleven pressure readings, showed that the variation of total head across the district was only two and three-fourths feet, and the smallest usable head recorded was nearly twenty-eight feet. It may be of interest to compare the pressures existing at the time of this investigation, which was at a time of most severe demand upon the distribution, with those of eight years ago, as follows:

	1888.	1895.	Gain.
Canfield ave., from Cass to Third....	11½ lbs.	18 lbs.	58 %
Hancock ave., from Cass to Third....	9 lbs.	15 lbs.	66⅔%
Warren ave., from Cass to Third....	9 lbs.	14½ lbs.	61 %
Putnam ave., from Cass to Third....	8¼ lbs.	14 lbs.	69 %
Holden ave., from Cass to Third....	8 lbs.	12 lbs.	50 %

Increase of head at engines, about 30 per cent.

From this it is seen that for each pound pressure added at the engines the consumers in this locality have had two pounds extra delivered to them, and very similar results might be shown elsewhere in our system.

Early in the past season some discussion took place regarding the quality of our water supply and the advisability of moving the intake from its present location to a point further up the river. As there appeared to be no reliable information then at hand that would aid in settling the questions raised, your engineer was requested to investigate, as far as possible, into what might be the sources of present and future contamination likely to affect our water supply, and what remedies or preventives might be applied. Since that time an extensive study has been made of the recent literature bearing upon the subject of water pollution and the treatment of polluted waters. A visit was made to the Lawrence Experiment Station, conducted by the State Board of Health of Massachusetts, where since 1886 there have been carried on the most careful and extensive experiments and investigations on water purification that have yet been undertaken anywhere in the world.

So far as chemical analysis is able to determine, our water compares most favorably with that of any public water supply in America, which fact has been frequently commented upon, and considering the inert matters only it may be said to contain nothing at all likely to prove disagreeable or deleterious to public health. Fifteen years ago to have said this would have been saying that the water was as near perfection for domestic purposes as any water known, but the developments of more recent investigation have proven that chemical analysis alone can afford no criterion of the healthfulness of a drinking water, and that the mineral matter and the dead organic matter which such a water contains are entirely harmless to the extent to which they ordinarily occur, while it is to the presence of certain minute living organisms, now believed to be the true germs of many diseases, that the harmful effects of some waters are due. These organisms are so small, many of them, that even the microscope is unable to distinguish them, and it is only by delicate and special methods that they can be identified. Organisms of this sort are found in all surface waters, and very frequently, if not always, in even very deep well waters. Fortunately for us, not all, nor even a large percentage of them are harmful. Of those which grow and thrive in ordinary waters none are known to be dangerous, but there are varieties not indigenous to the water, but which are capable of living for a greater or less period of time in it, that are disease producing. Such, for instance, are the germs of cholera and typhoid fever. These germs are given off in the dejecta of those afflicted with these diseases, and if they are permitted to mingle with sewage which finds its way into a stream farther on used as a water supply, the disease may be thereby transmitted. As the former of these diseases is little feared in America, only very limited investigations have been carried on regarding it here, but in Europe it was clearly and conclusively proved that the terribly fatal epidemic which visited Hamburg in 1892 and 1893 was caused by the transmission of cholera

germs through the water supply. Typhoid fever has been much more extensively studied, and though it is an old theory still maintained by some that it is caused by an environment imperfectly ventilated and drained, the bulk of authority, though admitting that imperfect sewerage and bad ventilation in his surroundings may and often do tend to render the subject particularly liable to infection, maintains the conclusion that typhoid fever is not in the original case produced from such causes. The most frequent sources of typhoid infection in those localities where especially thorough and painstaking investigations have been carried on are water and milk supplies. In one noted case raw oysters were proven to have caused the disease, and uncooked vegetables, such as lettuce and celery, have been looked upon as possible agents for its conveyance.

In considering any water supply it is therefore necessary to ascertain whether it is possible for the dangerous or pathogenic bacteria to gain access to it and whether their vitality is such as to enable them to live until they have traversed the distance between the source of contamination and the consumer of the water. To this end some knowledge of their life is needed. The typhoid bacillus has been perhaps more extensively studied than any other, and its term of life in Merrimac River water at Lawrence was found to range from ten to thirty days, the average period being about fifteen days, while in the purer effluents of some of the filters it appeared to be somewhat longer. There is excellent proof that typhoid germs traveled thirty-nine miles in the Merrimac River, over mill dams, through rapids and almost stagnant mill ponds, the last thirteen miles being affected by tide water, and after passing through pumps and water mains caused an epidemic among the water consumers, and there is abundant evidence of their similar transmission over shorter distances.

In view of these facts, a consideration of the quality of our water supply must include the investigation of all sources from which such contamination can reach it. The

most likely sources of typhoid infection of Detroit River water are the sewage discharges of the cities above us on St. Clair River. Port Huron being the largest of these, and the most of a city in its appurtenances, delivers the greatest quantity of sewage into the river, but its distance being so great, about sixty miles, it hardly seems probable that it can have much direct effect upon the water at Detroit. Yet St. Clair, Marine City and The Flats, as well as other towns, take water from St. Clair River and Lake St. Clair below Port Huron, and discharge their sewage into the same waters. It may, therefore, be possible that typhoid germs starting at Port Huron should cause disease at St. Clair, and from there be transmitted by stages to our intake. A more dangerous, though less constant, cause of pollution is found in the discharges of sewage from passing vessels, and viewing these two sources of contamination alone, it does not appear that any advantage would be gained by moving the intake up stream from its present location. The writer does not wish to be understood as saying that there is any proof of a single case of typhoid having been caused in Detroit from the above sources of infection, but is only pointing out a possibility. Another source of pollution, and the one most commonly considered, is the discharge of Connor's and Fox Creeks and several county ditches entering Lake St. Clair within three miles of the intakes. Of these, Connor's Creek is the largest and the nearest at hand, being only about one mile from the suction cribs. The drainage area of this stream and the ditches near it is about fifty square miles, with about 5,000 inhabitants, or 100 per square mile. Were such a population on the watershed of an impounding reservoir where water was stored for a considerable period before use, it would not be considered particularly dangerous. The Fox Creek watershed and the lake shore within Wayne County adds about twenty-five square miles more, having probably not to exceed eighty-five inhabitants per square mile. Re-

ing so sparsely settled, it does not seem likely that serious contamination could reach us from these sources, except under particular conditions. Thus far there are practically no sewers emptying into these streams, and at periods of ordinary flow it seems very doubtful if the waters of Connor's Creek, at least, can become sufficiently mingled with those of Detroit River, in the short distance they have to flow, to reach our intakes. It is only at times of heavy rains and the melting of snows that much dangerous matter would be at all likely to gain access to these streams. The character of the soil in this vicinity renders it extremely likely that at such times the water would reach these channels mainly over the surface, carrying with it whatever it found in its way, and at such times the higher velocities of the currents certainly causes these waters to mingle more thoroughly with those of our river, and undesirable matters may thus reach our intakes. There is very little chance for the water to improve in passing through our system, for ordinarily in less than twenty-four hours from the time the water enters the suction crib it is delivered to the consumer. That fevers apparently of water origin are often quite prevalent after heavy rains following periods of drouth, and after spring freshets, has been noted by some of our physicians. In view of this, it seems to your engineer that your honorable body should exercise a careful surveillance over these tributary waters and use all possible influence to prevent them from becoming the receptacles for sewage from any sources, particularly the villages on their watersheds. The Act of Incorporation of the Board of Water Commissioners provides, in Section 21, that your honorable body may exercise authority over the waters of Detroit River and Lake St. Clair within six miles of the intakes, to prevent pollution, but considering the facts already pointed out, this is not sufficient to insure our water supply from contamination as the populations above us increase. Whatever the conditions now, in the more or less distant future Detroit will be forced to follow the example of the European cities

having surface water supplies and purify its water before delivering it to the consumer. It is to be regretted that we have no reliable analyses furnishing us a clue to the true composition and contents of our water, and I would respectfully urge the advisability of having frequent biological and bacteriological analyses made by a reliable authority, as such a method would afford us most readily with information from which the true condition of affairs could be appreciated.

Whether our supply be now infected or not, it must be apparent that the existence of such conditions as are discussed above should admonish us to lose no time in endeavoring to reduce to a minimum the useless consumption of water, for aside from the bearing upon the present cost of operation, the cost of purification varies almost directly with the quantity purified. The subject of the restriction of waste is an old one in these Works, and much has been already done in that line, but much more, and the hardest part, remains to be accomplished before the consumption can be brought within those limits which present practice holds to be sufficient for all necessities. For the past three years your engineer has been devoting much attention to the consideration of this subject. Hourly records of the quantity of water pumped and the pressures maintained have been furnished this office since May, 1893, and from the reports furnished us by the Fire Department we have been able to obtain a reasonably accurate determination of the quantity of water used at fires for the entire year just closed. Memoranda collected by our own Meter Department give us the amount of water used for manufacturing and business purposes, which is checked by the difference between weekday and Sunday consumption. By applying the rules already laid down for temperature and precipitation effects, under some conditions it is possible to determine the quantity of water used for lawn and street sprinkling, preventing freezing, etc., with fair accuracy. To thoroughly discuss the subject of waste would require an amount

of space far beyond the compass of this report, but it is possible to outline some of the methods of determining the various quantities desired. The month of November may usually be considered a normal month, there being ordinarily no demand for water either for lawn and street sprinkling or to prevent freezing. With the fire consumption and that for manufacturing and business purposes determined and subtracted from the total quantity pumped, the remainder represents domestic consumption, waste and leakage. November, 1895, furnishes the following information:

Average daily per consumer consumption by plunger displacement	122.23 gals.
Average daily per consumer fire, business and manufacturing consumption	23.36 gals.
<hr/>	
Average daily per consumer domestic consumption, waste and leakage.....	98.87 gals.

From observations of the Meter Department, compared with our revenue statistics, your engineer determined that the average necessary daily domestic consumption would be about twenty-two gallons per consumer. If this figure should be correct, the waste and leakage must amount to 76.87 gallons per consumer daily. All will admit that during the hours from midnight to four in the morning the consumption of water in a city of even this size should be comparatively insignificant. Now, the smallest quantity pumped in a single hour in the past two years was between twelve and one o'clock on the morning of November 11, 1895, and amounted to 832,525 gallons. This is at the rate of nearly 20,000,000 gallons daily, or 76.4 gallons per consumer. This must be nearly all waste and leakage, and coincides very closely with the 76.87 gallons obtained above, and gives proof that the estimate of twenty-two gallons per person for domestic needs was very nearly correct. The average daily consumption for the past year has been about 40,250,000 gallons, and of this we find that almost 20,000,000 gallons are being wasted at that time of year when there is the least cause for waste to occur. Or, considering the month

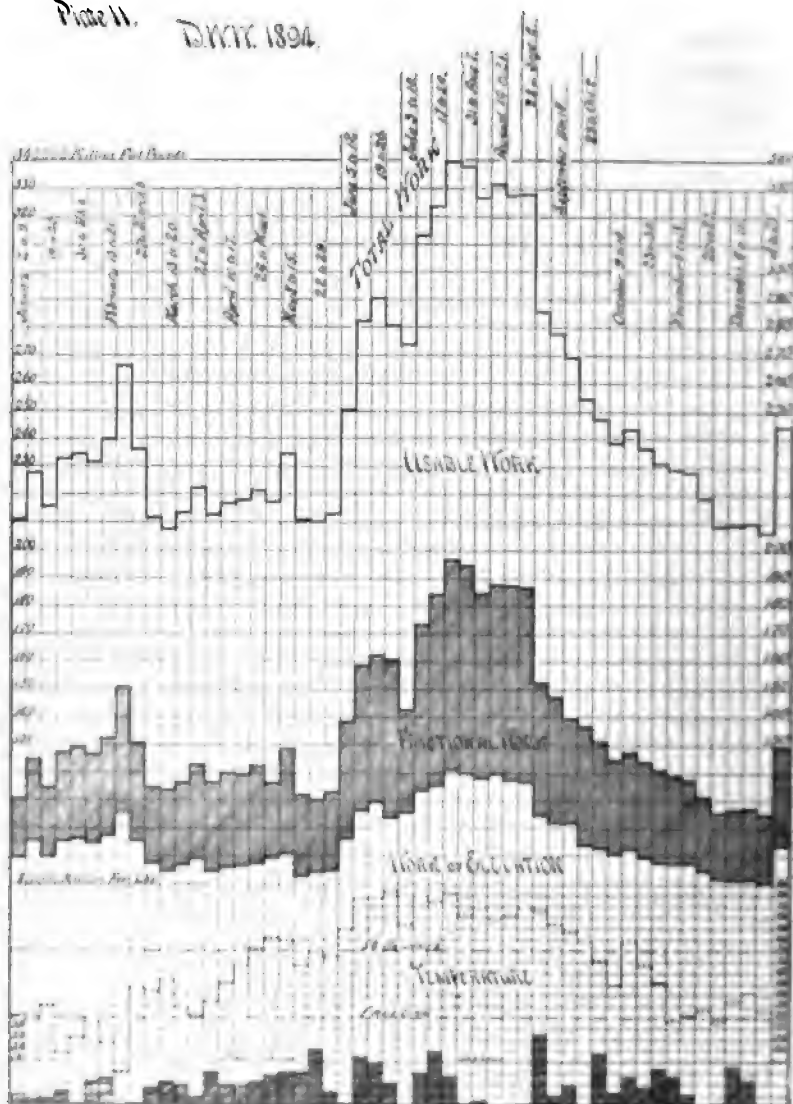
November alone, over 60 per cent of the water pumped appears to be serving no useful end. In the month of February the total daily consumption per consumer was 198.3 gallons. The average daily metered and fire consumption was twenty-two gallons, leaving 176.3 gallons for domestic uses, waste and leakage. During the maximum day the quantity used was at the rate of 234.6 gallons per consumer, of which the minimum hourly night rate was 223.3 gallons daily. In July the daily consumption per consumer was 168.2 gallons, of which 23.4 gallons were metered and fire consumption. Taking the year as a whole, the records of this office give the following information regarding consumption:

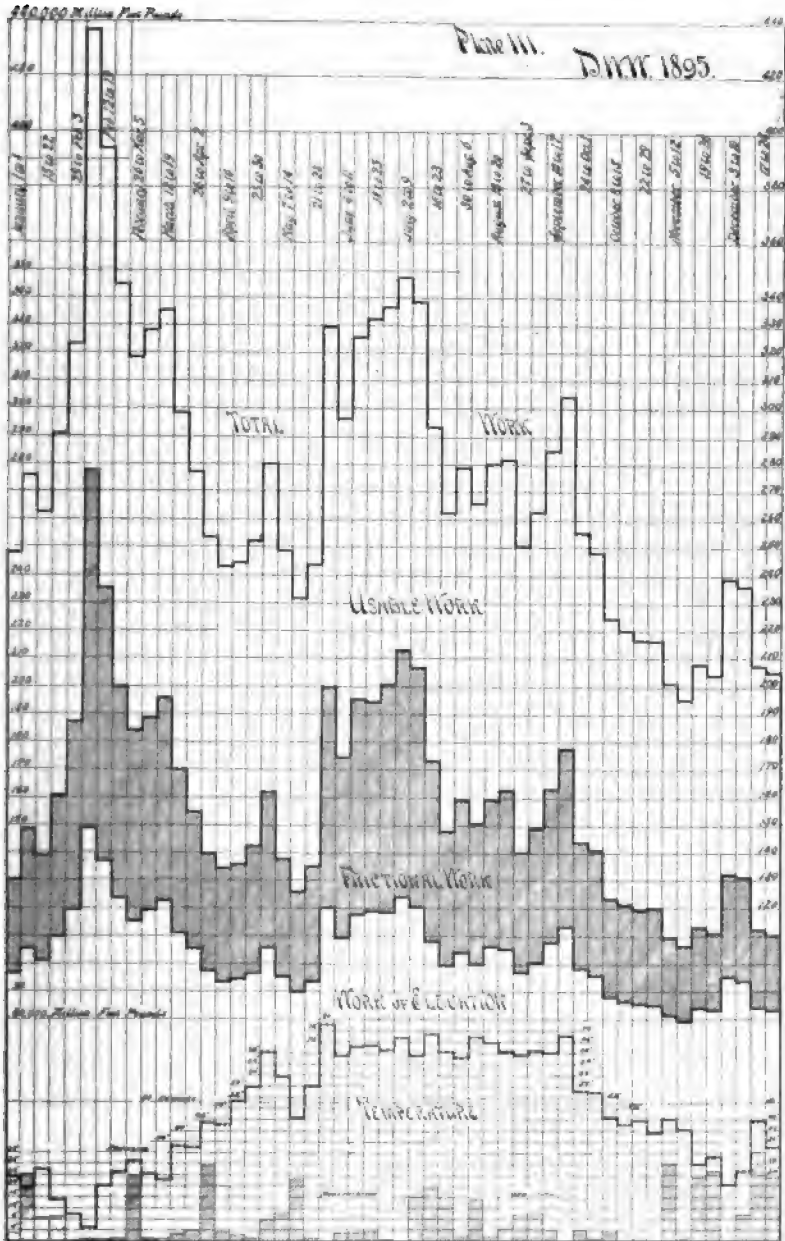
	Yearly. Gallons.	Daily. Gallons.	Daily, per Consumer Gallons.
Business and manufacturing, schools, etc., by meter	2,121,343,600	5,811,900	22.35
Domestic—household and culinary purposes	2,088,129,230	5,720,902	22.00
Lawn and street sprinkling and cooling purposes	1,064,000,000	2,915,070	11.20
To prevent freezing pipes.....	698,000,000	1,912,330	7.40
Public purposes—Hospitals, ceme- teries, asylums, fountains, sewer flushing, police and fire engine houses	365,000,000	1,000,000	3.84
Fires—From water mains only.....	10,596,000	29,000	0.12
Total useful consumption.....	6,347,068,830	17,389,102	66.91
Recorded consumption, 99% of plun- ger displacement	14,698,451,954	40,269,704	154.85
Correction for slip of pumps and error of register, 10%.....	1,469,845,195	4,026,970	15.48
Net recorded consumption.....	13,228,606,759	36,242,734	139.37
Useful consumption as above.....	6,347,068,830	17,389,102	66.91
Waste and leakage.....	6,881,537,929	18,853,632	72.46

In common language, allowing as free use of water for lawn and street sprinkling and to prevent freezing as was indulged in during the past year, and considering all as useful consumption, with all that used for business, manufacturing, schools, fires, public purposes and domestic needs

Plate II.

D.Y.R.R. 1894.





added, *for every gallon so usefully consumed more than one and one-tenth gallons ran to waste.* If any of the water so consumed were usefully employed, no effort should be made to restrain its use, but as no advantage can possibly accrue to anybody from the pumping to waste of this great quantity of water, decisive measures should be taken for its reduction. When the method can be applied, none is more effective in reducing waste than the application of meters to the service pipes of the consumers, but in our system this work is not keeping pace with the growth of the city. During 1895 there were nearly two and one-third times as many new connections added as there were meters set. Out of 48,918 connections now in use only 3,775, or less than 8 per cent, are metered. That some more comprehensive means of accomplishing the desired result must be found is, therefore, apparent. The most satisfactory method of dealing with the problem in hand thus far produced is by the aid of the Deacon Waste Detection Meter. This is an instrument which is set in the main, and mechanism operated from a clock records on a chart the quantity of water passing it at any moment. The mode of operation is to shut off the district to be examined, so that all water flowing into it must pass the meter. The observations are ordinarily conducted between midnight and four in the morning. The inspector goes through the district shutting off the service connections and side lines and recording the time each gate or valve is closed. By comparing these memoranda with the chart of the meter the amount of waste at each connection and in each street main is shown. The inspector is then possessed of the information regarding the location of the waste and all that remains is to see that the defective fixtures are repaired and the leaks in the mains stopped. On the application of this system in Boston, in a district containing a population of 21,760 persons, the consumption was reduced from 58.5 to 37.7 gallons per capita daily, a saving of 35.6 per cent, the night consumption being reduced 58 per cent. Similar results have attended the use of these

meters in Philadelphia and in many cities in England. The cost of the meters set in place in Boston was about \$400 each. I would respectfully recommend to your honorable body that ten of them be purchased and set in our system at points to control those districts in which excessive waste and leakage is most to be expected. The great advantage of using these meters over ordinary inspection is that the inspector's time is not taken up in visiting premises where there is no waste and the residents thereby uselessly annoyed, but he is able to devote his whole attention to those which need it. If our consumption during 1895 had been reduced only to 100 gallons per consumer, or about 35 per cent, the saving in fuel alone would have been over \$13,000, or more than 40 per cent of the entire fuel bill, the same pressures being maintained on the system.

In a city having so many miles of electric railway in operation as this it may be anticipated that trouble will be met with from electrolysis. This subject has been very extensively studied in and about Boston, but in spite of the pains taken with the investigations, the results thus far have failed to resolve the preventing of electrolytic effects in general into a soluble problem. It has been, however, observed that very small currents—even with as low a potential as 0.002 volt—are capable of producing dangerous effects, and that the constituents and amount of moisture in the soil appear also to have an important bearing on the case. While it has been frequently attempted in Boston to locate points of electrolytic action, and many excavations have been made to find the effects of it, none have resulted in the discovery of anything definite or conclusive in the matter. The most that can be said is that certain conditions tend to produce certain effects, but these effects are not always apparent in the presence of the conditions. Regarding our own system, we know that so far as the electric currents are concerned we have all the conditions required to produce electrolysis in our pipes, but thus far we have found no direct evidence that our mains are affected. The

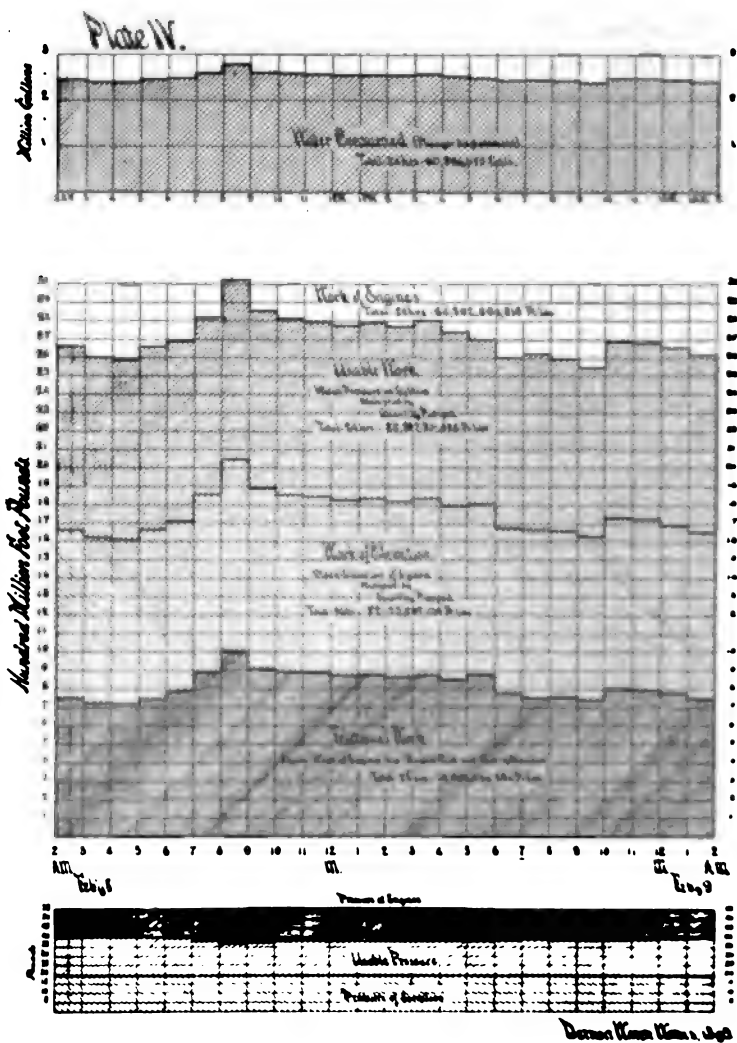
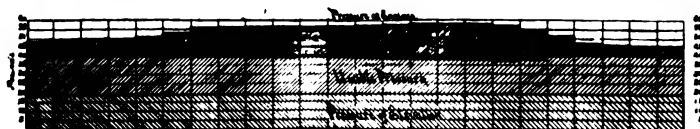
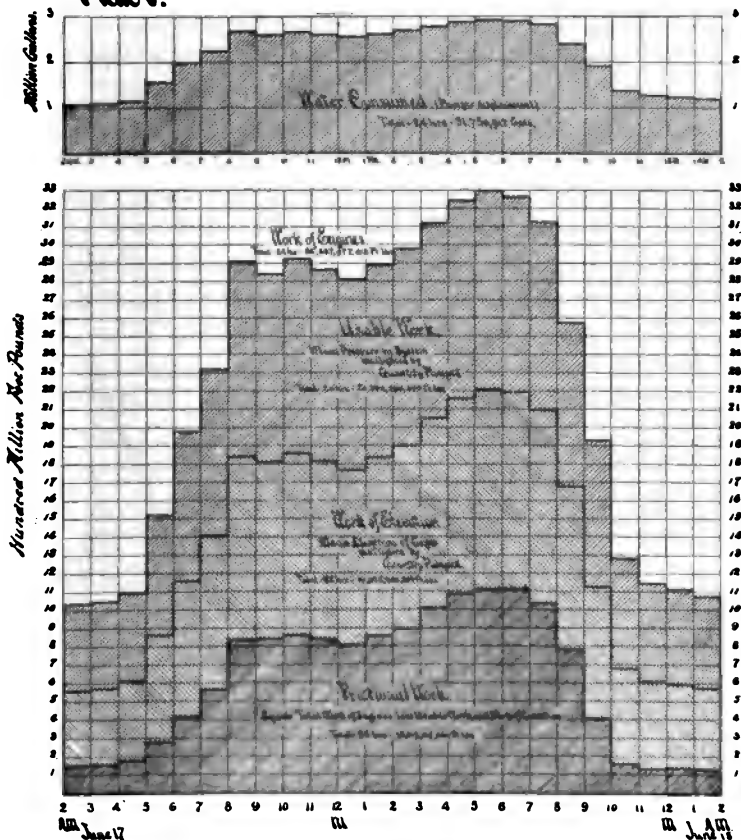


Plate V.



Danforth & Co., 1890.

most natural explanation is that the requisite constituents are lacking in our soil to produce the necessary chemical combinations, or it may be that the waste in the system being so great, a means of waste detection will be necessary to determine the location of electrolyzed pipe, even after the damage has been extensive. The study of the subject is one for the specialist, and so long as no general remedy is known, it does not seem wise to spend time or money in searching for a trouble which must, with our present knowledge, be treated as an individual case each time, and which, if serious, must finally manifest itself.

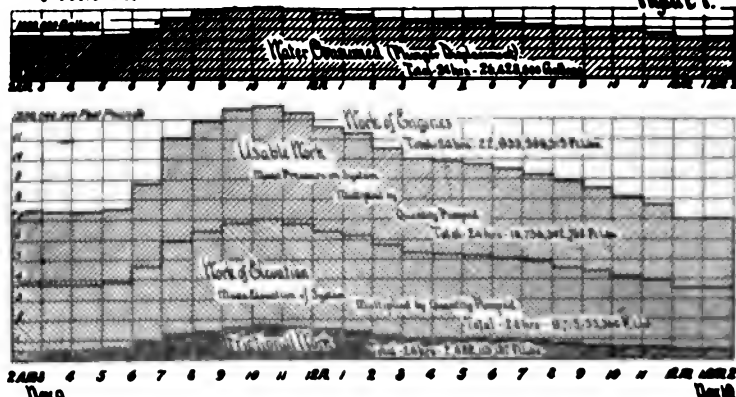
As shown in the report of the Chief Engineer of the Pumping Station, the efficiency of our machinery has been about 16 per cent higher than last year. This is due to at least three causes: First, the economy of Engine No. 4, the Allis engine, which has done 20 per cent of the work this year, thereby saving us about 7 per cent of the cost of pumping; second, the improvements to Engines Nos. 1 and 2, which probably account for about 6 per cent more; and, third, the increased head pumped against, allowing a more economical use of steam, probably accounts for the remaining 3 per cent. The effect of the running of Engine No. 4 is clearly shown on Plate I., page 54, where the work done weekly by each engine is represented in the upper diagram, and the quantity of work done per gallon of oil burned weekly is shown on the lower diagram. A correction has been applied to the quantity of oil used to allow for the lighting, but no correction for the heating of the buildings has been made. It will be seen that whenever Engine No. 4 does a fair percentage of the pumping there is a decided increase in the work of a gallon of oil. This plate also brings out the increased economy as the total quantity of work increases, which occurs with increasing head.

It was hoped at the beginning of the year that the new force main might be completed in sufficient time to enable the distribution system to show a corresponding gain, but this has not been the case. In consequence of the increased

consumption of water the work of the distribution shows a decrease of efficiency of about 4 per cent, leaving the net increased efficiency of the system as a whole 12 per cent, and, as before stated, two-thirds at least of this loss was due to the force mains being too small. The work of the system as a whole for 1894 is shown on Plate II., page 56, and that for 1895 on Plate III., page 57. These plates are made to the same scale, and the difference in the demands made at various times upon the system are at once apparent. Particular attention is called to February and June. Plate IV., page 60, shows the work of the system by hours for the day of maximum consumption, February 8, and Plate V., page 61, the same for June 17, which was a day of very large hot weather consumption. While in the former there were pumped nearly nine million gallons more water than in the latter, from the concentration of the demand into a few hours it is clearly seen that the summer day made by far the more severe tax upon the machinery and distribution. Under normal conditions, as shown in Fig. 1, Plate VI., page 64, the consumption and the work falls off gradually after reaching its maximum between nine and eleven o'clock in the morning; but in the case of summer consumption the area included in the hump of the diagram from noon until eight p. m. represents work consumed in lawn sprinkling. The quantity of water so used on June 3 last, as may be seen from an examination of Fig. 2, Plate VI., and of Plate VII., page 66, was 12,000,000 gallons, being nearly 25 per cent. of the entire daily consumption. In the former diagram the quantity of work expended for lawn and street sprinkling and cooling purposes on that day is represented by the dark area and was obtained in the following manner: The temperature for June 3, as shown by the full line in the lower part of the figure, was exceptionally high and as will be seen by reference to the middle diagram of Plate VII., page 64, followed a week of very hot, dry weather, this being in fact the hottest week of the year. The work of the engines by hours for June 3 is represented by the area enclosed by the

Plate VI.

Figure 1.



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Figure 2.

Work of Lawn and Street Sprinkling for June 3, 1909.

Line of Total Water Used.

Rain June 3, 1909.

Temperature of June 3.

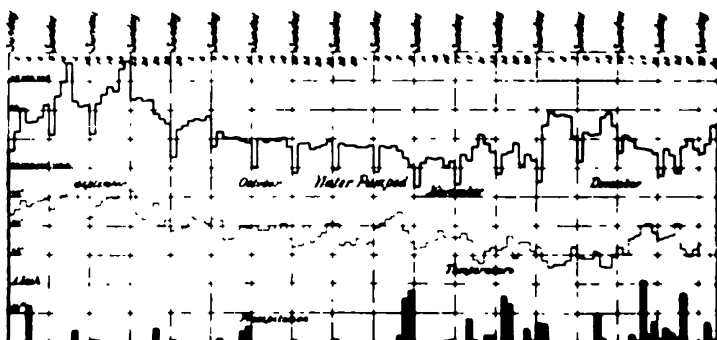
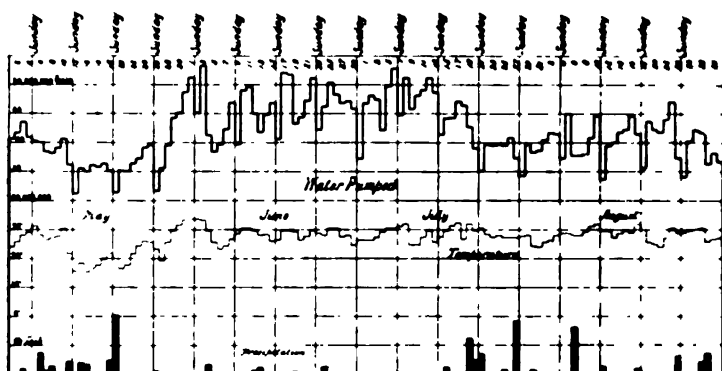
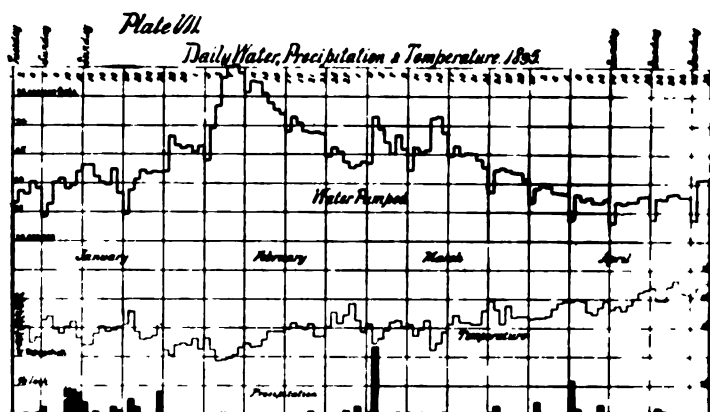
Temperature of June 4.

Temperature of June 5.

Hour	June 3	Water pumped	ft. per sec.	Total water	ft. per sec.	Total water
1	1	100,000	100,000	100,000	100,000	100,000
2	2	200,000	200,000	200,000	200,000	200,000
3	3	300,000	300,000	300,000	300,000	300,000
4	4	400,000	400,000	400,000	400,000	400,000
5	5	500,000	500,000	500,000	500,000	500,000
6	6	600,000	600,000	600,000	600,000	600,000
7	7	700,000	700,000	700,000	700,000	700,000
8	8	800,000	800,000	800,000	800,000	800,000
9	9	900,000	900,000	900,000	900,000	900,000
10	10	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
11	11	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
12	12	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
13	13	1,300,000	1,300,000	1,300,000	1,300,000	1,300,000
14	14	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000
15	15	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
16	16	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000
17	17	1,700,000	1,700,000	1,700,000	1,700,000	1,700,000
18	18	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000
19	19	1,900,000	1,900,000	1,900,000	1,900,000	1,900,000
20	20	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
21	21	2,100,000	2,100,000	2,100,000	2,100,000	2,100,000
22	22	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000
23	23	2,300,000	2,300,000	2,300,000	2,300,000	2,300,000
24	24	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
25	25	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000
26	26	2,600,000	2,600,000	2,600,000	2,600,000	2,600,000
27	27	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000
28	28	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
29	29	2,900,000	2,900,000	2,900,000	2,900,000	2,900,000
30	30	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000

Dr. H.

full heavy line of the diagram. June 4 opened with higher temperature and increased consumption, as is shown by the dotted lines of temperature and work, but at 9:45 a. m. rain began to fall. The effect of this was presaged by the sudden decrease of the demands upon the engines after 8 o'clock. The rain continued until 8 p. m. of that day, and though the total precipitation was less than one-quarter of an inch, it was accompanied by a fall of temperature from a maximum of 96° on the third to a minimum of 50° on the morning of the sixth. The work of the engines for June 5 is represented by the area below the broken line bounding the dark area. It seems clear that the only uses of water likely to be affected by a rain and such a fall of temperature are those for lawn and street sprinkling and cooling purposes, and hence any decrease of consumption or work at such a time must be due to a cessation of these uses. It will be at once appreciated that not all the water so used was shut off, but whatever difference there is between the consumption of June 3 and that of June 5 that is not accounted for by incidental causes, as fires and the day of the week fluctuations, may be fairly ascribed to the causes under consideration. Making corrections for the work caused by the fire between 5:30 and 8 p. m. of June 3, shown by the area marked "Fire," when four engines were in service, and for the usual nightly variations between Sunday and week nights, the diagram shows 13,475,131,167 foot pounds, or more than one-third of the average daily work for the year, and nearly two-thirds of the work of the day of minimum consumption (shown in Fig. 1, Plate VI.) as due to these causes. The use of such a quantity of water at times when every additional gallon means the bringing of our machinery so much nearer to the limit of its endurance leads to the consideration of whether some means of regulation bearing upon it should not be introduced. It is certain that the use of water for lawn sprinkling without charge has led to considerable abuses. It is not an uncommon thing to see a hose running with full head, the nozzle lying on the



sidewalk or thrust into a crack between the boards. Such waste of water is almost criminal. Upon the right means to apply in the solution of this problem it is hard to decide, but something should be done. A considerable relief might be obtained by restricting the size of nozzle used and limiting the minimum length of hose. If the lawn sprinkling could be confined to the night, the draught on the machinery would be much reduced and the lawns improved as well, for it is a wise provision of nature that veils the sun at times of rain. As things are now, should our lawn sprinkling continue to increase for another year as rapidly as it has done in the past, we will be forced to purchase additional machinery to meet this demand alone, while if it be properly controlled, even though other causes of waste be not abated, the present machinery may be relied upon to do our work for several years to come. This system having no reservoir to fall back upon in times of accident or emergency, must always have an extra engine to put into service. In the ordinary course of operation one engine is necessarily undergoing repairs, so that only three can be in commission continuously, of which one should be in reserve. There were times during the past summer when three engines running, and at their maximum capacity, were required for the afternoon demand, while the fourth was in need of repair. Because for several years no accidents to our machinery have occurred, we must not forget that we are continually running greater risks as age and service weaken the machinery and corrosion deteriorates our pipe, while the demands of our population lead us to each year crowd more closely what must be the limit of safety. Plate VII., page 66, shows the effect of temperature and precipitation on the daily consumption, and from this and similar plates for the preceding years the rules for their effects have been deduced.

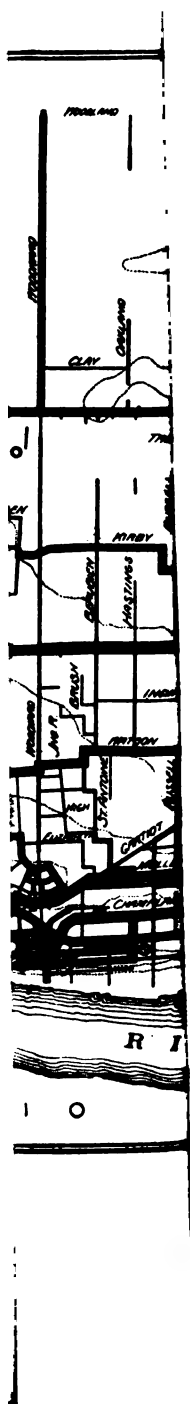
The work of the draughting room has been continued as formerly, and a vast amount of very valuable information has been added to our records. The territory between Mt. Elliott avenue on the east and Campbell avenue on the west

is completely platted by street intersections, and in many cases not only our own work, but all other underground construction is shown. The keeping of the records of construction in the field by a representative of the Engineering Department has been highly satisfactory, and much more reliance can be placed in the records so kept than in those furnished by the former system of foreman's reports.

In closing this report, I wish to express my obligations to the Inspector in charge of the Local Station of the United States Weather Bureau, to the United States Engineers' Office, and to the several city departments for courtesies and valuable information, and to my associates in the service of your honorable body for their hearty assistance and co-operation and friendly advice during the past year.

All of which is, gentlemen, very respectfully submitted.

G. S. WILLIAMS,
Civil Engineer.

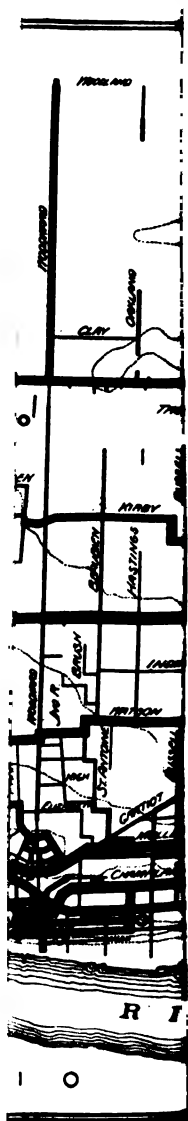


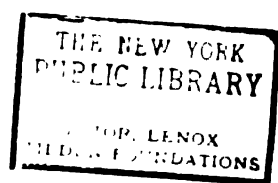
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All of which is, gentlemen, very respectfully submitted.

G. S. WILLIAMS,
Civil Engineer.





REPORT OF SUPERINTENDENT OF METERS AND INSPECTION.

Detroit, January 2d, 1896.

To the Board of Water Commissioners:

Gentlemen—In compliance with the rules and regulations of your honorable body, I herewith report the work done in the meter, inspection, service cocks and repairing leaks departments during the year 1895.

The following table shows the number of meters placed during the year and the total number in service on the 31st day of December, 1895:

	SIZES.								Total
	5/8 in.	3/4 in.	1 in.	1 1/4 in.	2 in.	3 in.	4 in.	6 in.	
In service Jan. 1, 1895.....	1,549	677	598	124	142	63	29	4	3,186
Placed during the year 1895..	362	110	55	26	24	5	7	.....	599
Total number in service Jan. 1, 1896.....	1,911	787	653	150	166	68	36	4	3,775

The following table shows the total number of meters in service, the different kinds and sizes, and also the number of indicators attached to hydraulic elevators:

In Service January 1, 1896.

KIND.	SIZES.								Total
	5/8 in.	3/4 in.	1 in.	1 1/4 in.	2 in.	3 in.	4 in.	6 in.	
Thompson.....	1,845	769	554	184	128	50	20	4	3,497
Crown.....	34	16	47	11	13	9	4	.....	134
Hersey.....	1	4	36	2	12	2	8	.....	65
Worthington.....	12	4	15	.....	12	7	8	.....	58
Union Rotary.....	8	.....	1	2	1	1	1	.....	14
Neptune.....	8	.....	.....	.....	1	.....	.....	.....	9
Trident.....	2	.....	.....	.....	.....	.....	.....	.....	2
Buffalo.....	1	.....	.....	.....	.....	.....	.....	.....	1
Aggregate.....	1,911	786	653	149	167	69	36	4	3,775

Indicators attached to hydraulic elevators. 11

Meters in Stock.

KIND.	SIZES.							Total
	5/8 in.	3/4 in.	1 in.	1 1/4 in.	2 in.	3 in.	4 in.	
Thompson (new).....		95	4	18	8	3		49
Crown	2		1	1				4
Hersey	1		10	1	1			13
Worthington	1		2					3
Union Rotary	1		6		1			8
Neptune.....	17		1					18
Trident	24							24
Aggregate	46	95	24	15	5	3		119

Valuation of meters in stock January 1st, 1896.....\$1,575 00

Valuation of material on hand January 1st, 1896..... 307 19

Valuation of tools January 1st, 1896..... 478 12

Valuation of horses, wagons, etc., January 1st, 1896..... 357 50

\$2,717 81

Valuation of meters in service January 1st, 1895.....\$85,687 03

Deduct 10 per cent. for depreciation in value..... 8,563 70

\$77,073 33

Add amount expended during the year for meters placed 17,587 85

\$94,661 18

Less stock on hand January 1st, 1896.....\$2,717 81

Less amount received for meters sold..... 371 79

3,089 60

Total valuation of meters in service January 1st, 1896..\$91,571 58

Cost of material used in repairing meters in 1895.....\$ 337 33

Cost of labor, repairing meters in 1895..... 1,495 58

Total cost of repairs..... \$1,832 91

SUMMARY OF TOTAL AMOUNT EXPENDED IN THE METER DEPARTMENT FOR THE YEARS
1889 TO 1895, INCLUSIVE.

	1889	1890	1891	1892	1893	1894	1895	TOTAL.
Meters.....	\$11,175 00	\$18,700 00	\$6,501 55	\$12,371 82	\$6,987 43	\$3,824 08	\$9,235 11	\$73,794 99
Supt, and labor.....	1,734 10	8,510 57	4,841 49	8,269 17	8,980 48	6,672 20	6,647 89	45,655 90
Material, tools, etc....	637 26	2,982 14	872 99	2,132 93	1,650 33	1,833 01	1,384 85	11,493 51
Freight, hauling, etc..	98 05	408 97	197 11	244 08	165 12	201 18	71 40	1,385 91
Horse, wagon, etc.....	.....	.....	.....	547 24	184 50	383 07	248 60	1,363 41
Totals	\$13,644 41	\$30,601 68	\$12,413 14	\$23,565 24	\$17,967 86	\$17,913 54	\$17,587 85	\$139,693 72

In presenting this report to your honorable body, I do so fully believing that the money expended in the meter department will prove to have been a wise and profitable investment for the Works.

We have placed 589 meters during the past year, 529 of them at the request of the consumer, showing that the meter is becoming a great favorite with water consumers. The total number now in use is 3,775, and the quantity of water pumped daily, when compared with that of six or seven years ago, will show what they have accomplished in the way of stopping waste. Although the per capita consumption has been reduced from 210 gallons daily to 144, yet it is much too large, and it could be lowered to seventy gallons at least without interfering with any of the legitimate uses. When the weather is not excessively hot or cold, the quantity pumped is not much over 100 gallons per capita, and with all plumbing in proper condition, it ought certainly to be kept at that point during that portion of the year when the heat does not call for a greater consumption.

An apartment house containing twenty-four families, with all modern water fixtures for domestic purposes, consumed an average of thirty-four and one-half gallons per capita daily during the last year. Another, containing six families, with modern fixtures (no washing done in the house, but quite a liberal use of hose), consumed only twenty gallons, showing that the present average consumption throughout the city is still excessive.

The objection is sometimes raised that such a low consumption would tend to produce disease, as the sewers would not be properly flushed, etc., but results in this and other cities that are largely metered does not bear out the claim. For instance, the death rate per 1,000 in this city in 1889 was 17.40 with no meters in use, while in 1895, with about 7 per cent of the service connections metered, it was only 15.80, showing a gradual decrease in the death rate, as well as the quantity of water consumed. In the City of Providence, R. I., in 1893 they had 17,417 service connec-

tions and 12,088 meters, which shows that a little over 69 per cent of their service connections were metered. Their death rate per 1,000 for that year was 20.92. In 1894 they had 18,152 service connections and 13,153 meters, making over 72 per cent of their services metered, and a death rate of 18.72, showing a decrease in the death rate and an increase in the percentage of metered services. They are placing about 1,000 meters each year in Providence, and their death rate in 1889 was 19.76 per 1,000, and in 1890 it was 21.77, which was the highest point reached, and then falling gradually to 18.72 in 1894, which was the lowest point reached in several years. They pumped in 1893 sixty-one gallons daily per capita, and in 1894 sixty-two gallons. In the City of Buffalo, with no restrictions, they pump about 300 gallons per capita daily, and have a death rate of about 17.34 per 1,000, while Detroit pumps about 144 gallons, and had a death rate in 1895 of 15.80. The average death rate in thirty-seven of the principal cities in the United States for the year 1894 was 19.22, with less than 10 per cent of the service connections metered. And when compared with Providence with a death rate of 18.72 and 72 per cent of their services metered, it would seem as though the use of meters, although largely reducing the consumption of water, does not affect the health of the community in which they are used. In other words, "stopping the constant running of small streams into the sewers does not create disease."

One source of great waste we have to contend with is the closet when placed where there is danger of freezing. The different appliances, or patent valves, that are being used for the prevention of frost in such cases are failures to a large extent, that is, so far as stopping the continual flow of water is concerned, as they are placed down in a vault and usually in an unhandy place to get at, they very soon get out of order so they will not operate, and allow the flow of water continually.

In order to reduce his water rates (which were \$16 per year) the owner requested us to place a meter on a small

double house of his containing two families, with no water fixtures excepting sinks in kitchen and closets such as spoken of. The results of two months were somewhat startling to the owner. In November and December the average quantity consumed was 9,172 gallons daily, which would amount to nearly \$120 per year. The estimated rates had been paid to January 1st, but from that time he will pay the meter rate, and, unless the closets are repaired, instead of making a saving, he will have to pay very nearly as much in one month as he formerly paid in a year, as such leaks never grow less without being repaired, the tendency being to increase until they get to the full capacity of the service pipe.

We have nearly 49,000 service connections in the city, and should every one of them waste the same quantity, there would have to be pumped into the mains about 450,000,000 gallons daily, which is four times the capacity of the works.

There are many such closets in the city, and on which meters should be placed. We have not forced meters on private houses only in a few cases, where pleading or a threat did not have even a temporary effect, but I should think it wise to place meters on all connections where such closets are attached, whether in private families or not.

The consumption in most of the charitable institutions seems to be excessive. The city pays \$1,000 per year for the supply of water to such institutions, and during the past year they have consumed 117,929,250 gallons, a quantity which at the regular rates would amount to over \$4,000. There ought to be some restriction on the waste of water in such places. As long as there is paid a fixed sum for them they ought to be limited to a fixed quantity (large enough for all reasonable purposes) and over which they should pay the regular rates. It is hardly among the probabilities that any of them would be obliged to pay anything additional, as there would then be an object in stopping the waste, and that being done, they would easily keep within the prescribed quantity.

The cemeteries also consume an unreasonable amount, for which they pay nothing. It would seem as though—while the water is furnished them without charge—they should show a reasonable disposition to not be wasteful in its use, but when the consumption at Elmwood is 16,806,000 gallons (amounting to \$569.20) in one year, and at Mt. Elliott 3,162,750 gallons (amounting to \$114.42), it looks as though very little attention was paid to the matter.

The rule allowing the free use of hose for lawn purposes on metered connections (as spoken of in my last yearly report) still continues to cause trouble in drawing the line where the free use shall stop and the charge begin. For instance, we have not considered a strip of grass two or three feet wide between the sidewalk and curb a lawn, and have required such hose connections to be placed on outlet side of meter, and in doing so have caused the consumers to claim that they have been discriminated against. The consumption in such cases (while confined strictly to the *lawn*) would be trifling, but the principal use of hose on such premises is for watering the street, and not only that, the careless use of it adds largely to the waste, as it is often thrown down and the water allowed to run for hours until it forms a rivulet in the gutter and finds its way to the sewer. We allowed a hose connection free on a certain place last summer where they had a large lawn, and also a livery stable, in addition to two residences. We had reason to think the occupant was trying to get the best of us, and therefore kept a watch on the premises, and were not long in finding that he had supplied himself with about seventy-five feet of hose, which he attached to the free hose connection and carried it to his barn, where he used it for washing his carriages, watering horses, etc. He was forced to remove the hose connection to outlet side of meter, and after that he had some hose for sale. We have had several similar cases to contend with, and, as I before stated, it causes much trouble and annoyance in deciding just where to draw the line between a metered and unmetered hose connection.

I should think it advisable on metered premises to have all water pass through meter, even though the meter rates should have to be reduced, or some reduction made in estimated rates, where every water taker would receive a benefit and have every hose assessed.

The expenses of caring for meters increase each year, owing to the steadily increasing number in use. On account of the intense cold during a large portion of last winter, we had many meters frozen, and thereby adding somewhat to the cost of repairs. Where meters were frozen through the carelessness of consumer, and all of those placed at request of same, the cost of repairs was charged to them and collection thereof enforced. With few exceptions the damage is repaired at the cost of two or three hours' labor, no new material being required.

We have formerly estimated the life of a meter to be ten years, but with our present experience think it will be much longer, as we have tested quite a number that have been in service nearly seven years, and in ordinary service they show but little wear. When they have been doing a large amount of work, that is, running up to their full capacity, the gear train shows evidence of wear, and in some instances have been replaced with new, but at a trifling cost, and even though the whole measuring chamber should have to be replaced it would only be at an expense of 20 per cent of the cost of the machine, and when this is done it is to all intents and purposes as good as new.

During the past season we have been obliged to replace some of our wooden meter wells (that were built six years ago) with brick. The wood begins to show evidence of decay, and when they are outside of the line of lot we are obliged to replace them with brick, as the Board of Public Works allows no more wood used for meter wells. We have at the present time 996 meter wells; 816 were built by us and 180 by the consumers; 781 of our wells are of wood and 35 brick. Consumers have 155 wood wells and 25 brick. At the

present time, nearly all the wells that are required are built by the owner of the premises on which the meter is placed, so that hereafter our greatest expense in wells will be to repair those already built on premises where we forced the meter.

INSPECTION.

The leak examiners have made 55,834 examinations during the last year, and reported 4,482 leaks, 3,948 of which were repaired within the time given for same and 534 were ordered shut off for failure to make the necessary repairs.

The percentage of leaks to number of examinations made was 8.02, being an increase over the previous year, when they were 7.48. The only way to account for the increase is in the larger number of old service pipes of light and medium weight lead which have been in the ground for years. At the time they were put in, the pressure on the mains was much lower than at the present, and they answered every purpose, but with age and increased pressure they are now giving away rapidly, and it will require the strictest attention on the part of the examiners in order to keep the leakage from this source within the present bounds.

Much waste is wilful and no amount of persuasion or force can stop it. In case the water is shut off for wilfully letting it run to waste, the occupant makes all manner of excuses and promises, and succeeds in having it turned on, to have the very same thing occur again, and it is almost impossible to stop it other than by placing a meter on the premises, a remedy that is always successful.

The examiners, in addition to the foregoing work, are occupied from ten to twelve days each month in reading meters and delivering meter bills.

SERVICE CONNECTIONS.

Fourteen hundred and twenty-seven service connections were made during the past year, consisting of 730 five-eighths-inch, 606 one-inch, 44 two-inch, 19 three-inch, 24

four-inch and 4 six-inch. Sixty-eight were discontinued, making the total number of service connections in use January 1st, 1896, 48,918.

In addition to the above we have inserted 334 five-eighths-inch and 237 one-inch service cocks for the iron pipe department on streets where the old mains had been removed and larger ones put in their places. In such cases we have been obliged to connect all of the old service pipes to the new mains, making a total of 561 service cocks inserted for the department. All of those removed were of the old drive cock pattern and could not be used again, as all service cocks are now tapped in—that is, being inserted with a thread or screw instead of being driven in after the hole had been drilled, as was formerly the custom. There are about 1,100 pounds of the old cocks, which are composed of brass and can be disposed of for whatever such metal is worth.

There were 637 less service connections made last season than the year previous, accounted for by the number of wood logs taken out in that year, on which there were 603 service connections. At the time they were put in the Water Works issued a permit, without charge, to tap the wood pipe, as the plumber made the connection and furnished the service cock himself, but when the wood was replaced with iron it necessitated new service cocks and the labor of inserting them, for which the owner of the premises was obliged to pay, and as a large number of wood logs were removed that year (in fact, the last that were in service) made more than an ordinary number of service cocks inserted.

The following statement will show the receipts and disbursements in the service cocks department during the year 1895:

Receipts for service cocks.....	\$ 5,102 50	
Receipts for plumbers' licenses.....	559 45	
Receipts for labor and material.....	301 57	
		<hr/> \$5,963 52
Total expense service cocks department.....	\$10,909 16	
Less labor of inspectors.....	5,016 00	
		<hr/> \$5,893 16
Balance to credit of service cocks.....	\$ 70 36	<hr/>

INSPECTION OF NEW WORK.

The inspectors have given strict attention to the work in their department during the past year, so much so that they have become a terror to a few of the plumbers who in former years were inclined to cover up some portions of their work before being examined, fearing that it would not pass inspection.

This work has been increased of late, as they are now obliged to shut off all vacant houses, and also let them on when reoccupied, and report to the Assessor of their district the facts for a new assessment. It makes many additional calls for them and necessitates many long drives, especially in the outlying districts. They are also still busy preparing their new record of service connections and locating stop boxes. What was said last year on this subject will bear repeating: "The inspectors have devoted much time to locating and making a record of all stop boxes. They are taking new measurements, as there has been so much changing and subdividing of lots since the beginning of our record that in many instances we find the location not properly recorded, and when the boxes happen to be covered up it takes much valuable time to find them, especially so in case of a bursted pipe. It necessitates the utmost vigilance to keep the boxes exposed to view. Sidewalks being repaired, new ones built, or change of grade in street, alley or lot, the tendency is to pay very little attention to the stop box, and it is usually covered up, as the majority of property owners can see very little use for it until there is an urgent request to shut off the water on account of a

burst pipe, when they have a forcible reminder of its necessity."

There were 18,394 places reported to be shut off for non-payment last year, besides 3,634 to be shut off for vacancy, which would also show the necessity of keeping the boxes in sight at all times, and as there are about 50,000 of them, it is quite evident that it will require strict attention at all times on the part of the inspectors to see that they are kept in proper condition.

The following table shows the duties performed by the inspectors of new work during the year 1895:

INSPECTION OF NEW WORK.

INSPECTORS.	District.											Totals.
		Examined New Connections.	Examined Extensions & Fittings.	Let on New Connections.	Notified for Building Tax.	Calls for Non-Payment.	Shut for Non-Payment.	Shut for Re-occupied.	Shut for Vacancy and Request.	Examined for Assessors.	Meter Bills Delivered.	
John Hatzembuhler	1	315	301	284	59	2,011	268	206	312	1,239	937	5,882
Robert Pelham, Jr.	2	165	341	113	73	1,939	89	227	293	670	1,079	4,989
C. K. Skinner.	3	116	929	103	94	2,874	81	435	607	751	854	6,844
William Forsyth	4	99	667	60	17	2,758	82	317	502	712	979	6,193
Frank Clark	5	149	452	71	33	3,726	143	563	535	488	1,446	7,661
Michael Hart.	6	203	477	132	93	1,727	260	543	428	755	1,029	5,697
John Becker	7	186	237	99	58	1,752	113	538	550	1,156	1,159	5,798
Adolph Jasnowski.	8	245	432	226	19	1,607	140	445	357	936	798	5,205
Totals. ....	...	1,428	3,836	1,088	441	18,394	1,131	3,274	3,634	6,707	8,231	48,264

PLUMBERS AND PLUMBING.

One hundred and twenty-five licenses were issued to plumbers last year. Although they are all required to produce a certificate from the Board of Health showing that they have passed a satisfactory examination—before the Board of Plumbing Examiners—as to their qualifications as a plumber, the number receiving licenses is about the same as the previous year, showing that very few had to go out of business on account of not being able to pass an examination.

The most serious complaints that come from the inspectors against plumbers is that of putting water fixtures in old buildings (such as baths, closets, etc.) without taking out a permit for same. We have found on different occasions that such fixtures have been put in houses without any report being made to this office. They are usually discovered by accident and sometimes not until after they have been in several years, when it is almost impossible to locate the plumber who did the work, as the occupant (if he knows) does not care to expose him, as he has been receiving a benefit through the plumber's neglect. When we discover a plumber who has neglected to make such report, he, of course, has some excuse to offer, such as neglect of his book-keeper to take out permit, or else claim that it was taken out and through some neglect in this office there was no account made of it, at the same time failing to produce the permit, which would look as though he was the only one at fault.

Our rules provide that a failure to perform work in accordance with them shall subject the plumber, in the discretion of the Board, to a temporary or permanent forfeiture of his license, but the penalty has never been enforced; such complaints are usually against the larger firms and they have little fear of their license being revoked. If it were possible to impose a fine of five or ten dollars for the first offense and have the amount collected before granting them

another permit, I think it would go far toward bringing about a more rigid compliance with our rules. There are undoubtedly many water fixtures in the city to-day, that have been put in old houses, that are not on the assessment rolls on account of the neglect of plumbers in not taking out permits for doing such work and—if the Board have the authority to do so—I think a reasonable fine applied in such cases would have a beneficial effect. With the exception of the foregoing, the plumbers are giving us very little trouble indeed, as a large majority of them seem to have made an extra effort during the past year to comply with the rules governing them, and were it not for a few careless ones, there would be very little occasion for the censure of any.

TABLE showing the number of taps made, and the different sizes, in each ward during the year 1895; also those discontinued.

NEW CONNECTIONS.	SIZES.	WARDS.																Total Inserted.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Iron pipe	4-inch	12	4	20	8	25	20	16	47	41	63	28	50	56	55	156	129	780
"	1-inch	57	65	29	48	21	29	13	36	80	29	19	19	55	50	79	27	606
"	2-inch	6	9	3	2	1	5	2	1	8	2	...	2	...	1	4	8	44
"	3-inch	2	6	1	1	1	...	2	...	...	...	8	...	1	...	...	2	19
"	4-inch	5	2	1	2	1	2	1	1	1	2	...	...	4	1	1	...	24
"	6-inch	2	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	4
"	8-inch	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
"	10-inch	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Aggregate.		84	86	55	63	49	56	34	85	75	96	50	71	116	107	240	161	1,437
DISCONTINUED CONNECTIONS.																		Total discon- tinued.
Iron pipe	4-inch	9	9	5	4	10	1	2	1	...	4	1	1	4	2	...	1	54
"	1-inch	4	...	...	...	...	...	5	...	...	...	1	...	...	...	4	...	14
Aggregate.		13	9	5	4	10	1	7	1	...	4	2	1	4	2	4	1	68

TABLE SHOWING THE NUMBER OF SERVICE CONNECTIONS
IN USE JANUARY 1st, 1896.

SIZE OF CONNECTION.	No. IN 1894.	ADDED IN 1895.	DISCON- TINUED IN 1895.	TOTAL JANUARY 1, 1896.
$\frac{1}{4}$ inch	36,821	730	54	36,997
1 "	10,888	606	14	11,480
2 "	137	44	....	181
3 "	115	19	....	134
4 "	90	24	....	114
6 "	5	4	....	9
8 "	2	....	....	2
10 "	1	....	....	1
	47,559	1,427	68	48,918

REPAIRING LEAKS.

Although numerous leaks have been reported during the past year, none of them have been of a very serious nature and all were repaired without difficulty.

The force in this department, under the immediate charge of Foreman Wallace, have performed their work most satisfactorily. It requires much skill at times to repair some of the leaks they come in contact with, and only men that have had much experience in that line of work are able to handle them successfully. Eighty-three leaks were repaired in the main pipes during the year. Twenty-six of them were caused by broken pipes and fifty-seven were leaking joints. Of the broken pipes, twelve were of 4-inch, ten of 6-inch, and four of 8-inch, and of the leaking joints, two were in the 3-inch, fourteen in 4-inch, eighteen 6-inch, three 8-inch, three 10-inch, two 16-inch, six 24-inch, four 30-inch and 5 in the 42-inch pipe. Fifty-five gates of different sizes were found leaking and repaired; 1,379 leaks were found in service pipes, all of which were repaired by owner of premises on which they were located. Three hundred and forty-five complaints of "no water" were investigated; many of them were caused by frost, and many more from various

causes. The water is often let on at the corporation stop and shut off in the cellar in new and vacant houses, and when the tenants move in they complain of "no water" without investigating the cause. We had 83 complaints of "bad water," all of which were remedied by opening blow-off gate and flushing the main. The remedy in most cases, however, is only temporary, as when they are on "dead ends" the same operation has to be repeated quite often. In fact, we have adopted the system of opening all such gates once each month and by doing so we have reduced the number of such complaints very materially. The total number of blow-off gates at the beginning of the year was 521; since that time there have been 68 added, and 30 discontinued, making 559 at the present time. This includes permanent and "dead end" blow-offs. The "dead ends" in the main portion of the city are gradually being done away with, but new ones are being added in the outskirts where it is impossible to avoid making them.

There are many new connections put in on premises where the old one is too small, and where this is done we require the old one to be disconnected (or shut off) at the main, so there will be no chance of it leaking in the future. We have much trouble at times in enforcing this rule, as the expense of disconnecting (where it is some distance from the new connection, as is often the case) is such that the owner thinks it is arbitrary on our part to require it shut off on the main, claiming that it will answer every purpose to shut it off at the line of the lot, but if they are allowed to remain in the ground, and shut off at the lot line, it is only a question of time when it leaks, and then we are called upon to repair it. Such leaks usually break out in the winter time when they are the most difficult to locate, as the water often works along in the ground or under the pavement many feet before coming to the surface, and it is sometimes very difficult indeed to find the source from which it comes, making it very expensive, as it necessitates taking up the pavement in different places, which is

an injury to the pavement also. We have had much trouble with old service connections that have been abandoned in years past and allowed to remain without having been disconnected at the main, and we are now trying to prevent future trouble from that cause. In a few instances where there has been asphalt, or new pavement on a plank foundation, making it very expensive to open it, we have allowed the old connection to remain, requiring it to be disconnected at the stop-box, which box must be kept in place so that the service pipe can be located at any time.

There is considerable time lost by the men in this department going to and from much of the work they have to do. For instance: A man is sent to the extreme limits of the city (and sometimes beyond the limits, as there is much pipe outside) and before he gets to the point sent, something else happens that requires attention in the same locality, and it necessitates sending another man very nearly over the same route. As the city covers so much territory it seems to be only a question of time when it will be necessary to establish small sub-stations, say one in the east, one west and one in the northern portions of the city, where the men can be distributed, and attend to the work in the vicinity of said stations, thereby saving much time that is now spent in going to and from those points.

The following table will show much of the work done in this department during the last year:

STATEMENT OF LEAKS, COMPLAINTS, ETC., FOR THE YEAR 1885.

MONTHS.	LEAKS.			COMPLAINTS.				SHUT.		LEFT ON.			GATES.				Boxes Set to Grade.	Pipes Frozen.	Let on—Miscellan- eous.	Shut—Miscellaneous.	Service Pipes Dis- connected.	Service Cocks Re- placed.	Stop-Boxes Located.	Mains Secured.		
	In Mains.	In Gates.	In Service Pipes.	Blow-Offs Opened.	No Water.	Bad Water.	Short Supply.	Water Running.	Vacant.	Non-Payment.	For Leak.	Vacant Re-oc- cupied.	Non-Payment.	New.	Opened.	Shut.									Found out of Order.	Located.
January	4	2	20	98	17	..	..	16	6	2	56	4	11	..	..	..	1	1	..	..	..	..	..	..
February	12	2	101	44	52	1	7	12	9	1	118	17	40	2	34	6	..	..	..	..	..	..	..	..
March	7	7	64	142	60	6	5	5	4	1	85	23	12	2	54	2	..	..	..	..	..	..	..	..
April	10	5	150	12	40	2	4	6	12	2	100	61	105	9	24	2	1	..	..	..	..	..	..	..
May	5	2	127	172	42	2	20	5	10	2	109	29	86	2	26	2	..	..	..	..	..	..	..	..
June	10	4	112	216	26	5	22	4	10	..	67	25	21	2	12	11	..	..	..	..	..	..	..	..
July	2	2	119	200	14	19	10	5	16	11	42	26	106	9	62	2	..	..	..	..	..	..	..	..
August	4	..	106	78	4	14	2	2	9	5	22	56	92	9	50	21	2	..	..	..	..	..	..	..
September	5	2	175	122	26	12	8	6	15	..	55	47	27	9	15	14	2	..	..	..	..	..	..	..
October	9	4	141	220	22	16	8	6	20	12	51	56	156	19	12	12	4	..	..	..	..	..	..	..
November	10	6	72	202	14	2	1	2	46	2	51	20	56	6	42	4	..	..	..	..	..	..	..	..
December	4	10	72	166	16	1	5	10	22	2	62	50	14	6	7	7	..	..	..	..	..	..	..	..
	52	55	1,279	2,022	245	62	102	60	129	41	928	455	626	72	262	202	4	7	10	122	42	50	42	12	12	

Attached to this report are a complete list of tools on hand and an itemized account of material in stock in the Meter, Service Cock and Repairing Leaks Departments on the 31st day of December, 1895.

In closing, I beg to thank your honorable body, and the General Superintendent, for the very considerate treatment extended me on all occasions. Also to the heads of the different departments of the Works I am indebted for many courtesies for which I herewith tender my sincerest thanks.

All of which is respectfully submitted.

T. R. PUTNAM,
Supt. Meters and Inspection.

REPORT OF CHIEF ENGINEER AT PUMPING WORKS.

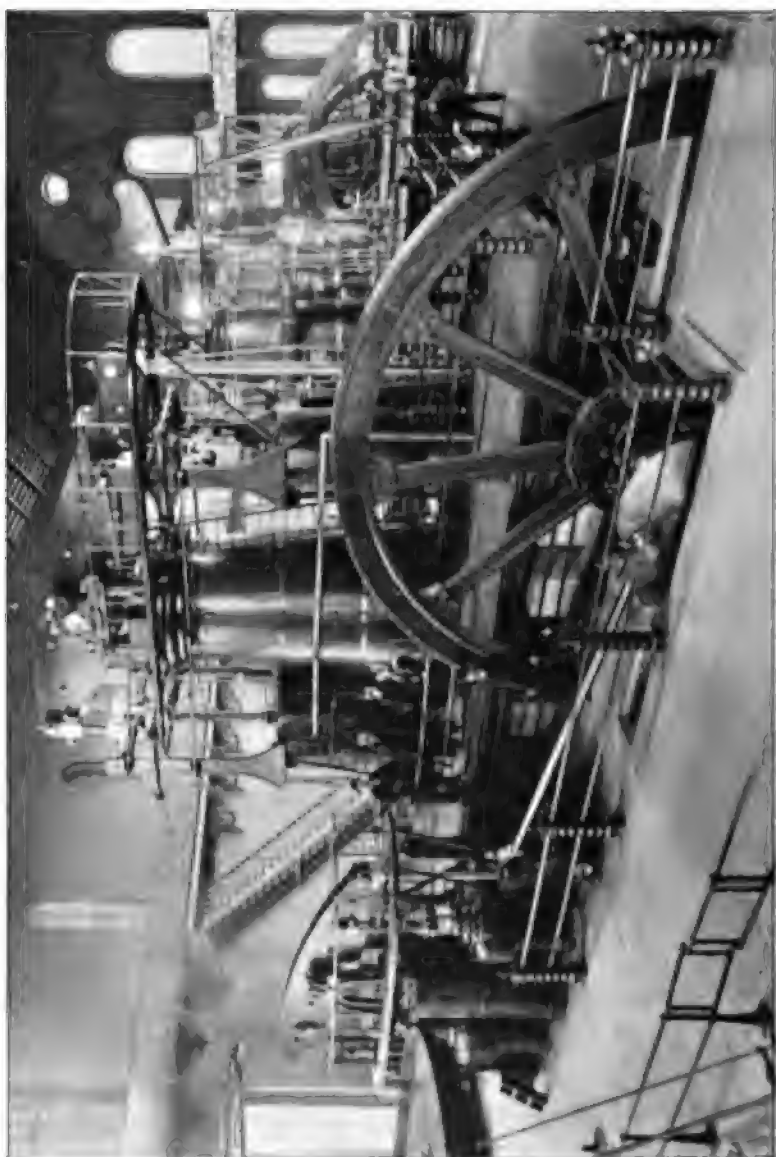
Detroit, January 1, 1896.

To the Board of Water Commissioners:

Gentlemen—I have the honor to submit the Engineer's report for the year 1895.

The following table shows the number of gallons of water pumped, and cost of fuel for the years named:

YEAR.	GALLONS OF WATER PUMPED.	COST OF FUEL CONSUMED.	AVERAGE DAILY DELIVERED.
1862.....	235,440.271		646.411
1863.....	203,581.743	\$2.189 37	981.584
1864.....	276,265.126	2.271 34	1,080.886
1865.....	542,867.064	3.325 81	1,497.143
1866.....	692,194.946	4.017 44	1,846.221
1867.....	697,194.625	3.963 30	1,909.627
1868.....	714,001.307	3.655 20	1,967.373
1869.....	782,112.282	3.194 15	2,162.774
1870.....	870,026.451	4.196 21	2,393.540
1871.....	966,129.123	4.414 07	2,622.408
1872.....	964,945.949	3.150 95	2,725.478
1873.....	1,035,796.043	4.670 46	2,837.408
1874.....	1,078,360.255	7.647 42	2,839.078
1875.....	1,040,514.897	7.373 49	2,875.363
1876.....	1,046,317.922	9.349 16	2,877.543
1877.....	1,425,525.226	10.121 89	3,905.578
1878.....	1,660,545.125	11.379 23	4,507.945
1879.....	1,946,410.225	11.247 92	4,511.879
1870.....	1,966,060.069	12.713 78	5,112.466
1871.....	2,300,150.625	14.641 05	6,301.799
1872.....	2,784,252.574	17.736 46	7,601.462
1873.....	3,194,380.944	20.233 30	8,794.735
1874.....	3,269,872.632	20.431 71	9,013.250
1875.....	4,297,454.290	21.393 86	11,567.372
1876.....	4,065,194.370	19.692 89	11,167.459
1877.....	4,271,239.700	17.433 72	11,543.129
1878.....	4,645,743.230	10.943 82	11,908.146
1879.....	5,129,559.110	11.919 51	14,053.696
1880.....	5,559,960.910	12.276 60	15,172.056
1881.....	6,345,127.999	16.556 63	17,696.377
1882.....	6,294,000.132	12.156 16	17,361.440
1883.....	7,372,927.194	16.495 99	20,217.334
1884.....	8,510,614.140	19.877 07	23,253.044
1885.....	9,970,829.580	21.341 48	27,317.341
1886.....	10,576,571.254	20.327 24	29,273.697
1887.....	11,668,659.844	25.492 83	32,079.166
1888.....	11,380,166.670	22.568 66	30,397.716
1889.....	12,475,394.453	24.413 31	35,974.494
1890.....	12,120,944.532	31.462 40	33,809.167
1891.....	12,057,361.236	33.496 46	33,033.666
1892.....	12,676,612.492	31.081 40	34,192.699
1893.....	13,477,077.104	27.479 93	37,021.555
1894.....	13,649,779.045	29.293 47	37,396.026
1895.....	14,029,451.954	32.085 00	40,299.721



ENGINE ROOM.

The following tables show in detail the work done by each engine each month of the year:

ENGINE No. 1.

MONTHS.	Time run.		Revolutions.	Gallons Water.
	H.	M.		
January	072	...	881,806	585,507,378
February	96	...	58,638	62,987,980
March	68	45	100,319	118,509,786
April	586	55	848,865	425,178,670
May	370	55	233,861	242,450,585
June	568	...	846,926	896,268,900
July	253	05	158,802	185,296,120
August	47	...	29,867	26,725,642
September	430	10	232,824	288,732,790
October	578	...	326,117	366,923,680
November	671	30	393,369	463,813,104
December				
Total	4,340	30	2,609,379	3,164,874,938

ENGINE No. 2.

January	168	...	96,423	155,056,224
February	456	...	306,091	467,600,832
March	480	...	299,123	404,907,664
April	398	20	223,847	274,429,776
May	618	...	361,781	575,577,596
June	337	06	198,062	277,996,072
July	201	05	127,675	165,432,912
August	876	15	230,052	250,198,536
September	559	25	327,123	440,480,160
October	120	15	70,238	108,704,712
November	206	...	124,664	155,685,784
December	192	...	114,735	160,630,128
Total	4,114	25	2,459,819	3,436,596,856

Total consumption of oil,
1,929,142 gallons.

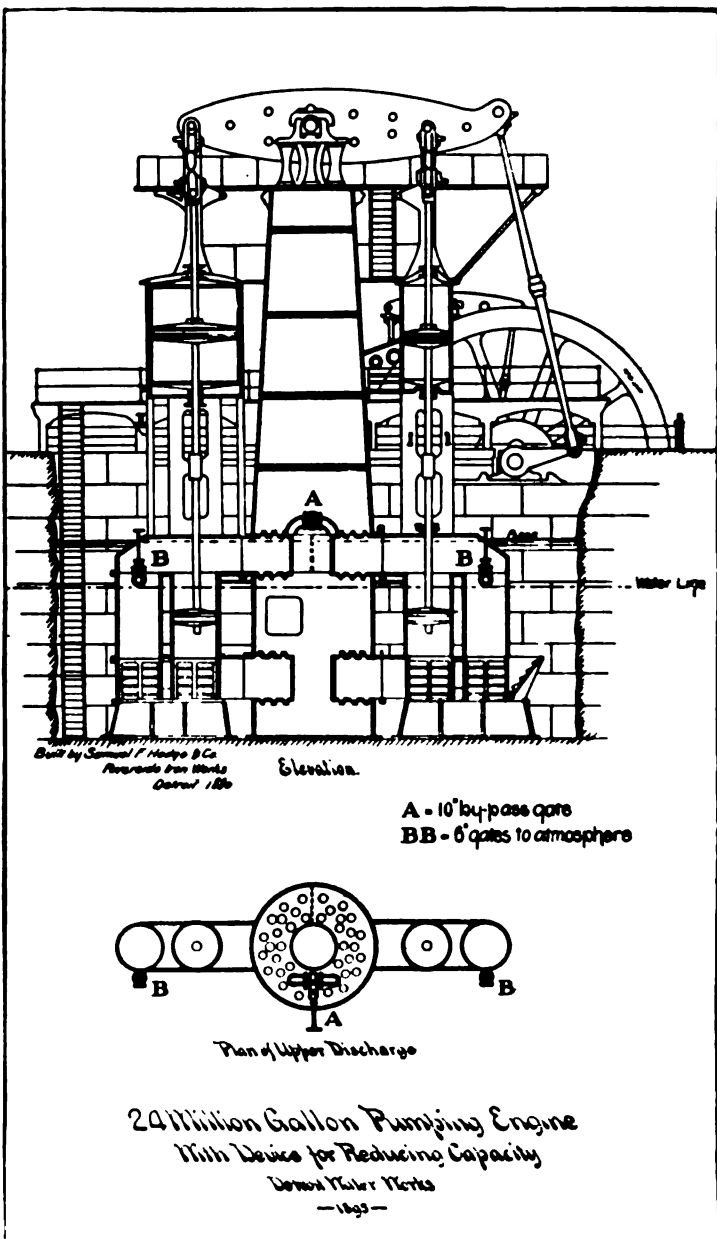
Total cost.....\$32,095.00

ENGINE No. 3.

January	353	...	361,006	681,610,800
February	744	...	434,595	789,271,000
March	720	...	404,750	729,550,000
April	168	...	103,115	185,607,000
May	480	...	296,658	583,975,400
June	536	...	310,920	559,656,000
July	373	30	212,386	382,284,800
August	594	30	352,040	683,672,000
September	672	...	375,207	675,872,600
October				
November				
December				
Total	4,890	...	2,840,672	5,113,209,600

ENGINE No. 4.

January	647	35	677,460	531,806,100
February	393	45	424,142	332,951,470
March	166	...	178,060	139,777,100
April				
May				
June	346	06	392,390	308,026,150
July	310	15	300,237	235,686,045
August	592	06	559,903	439,445,355
September	144	...	140,691	110,442,435
October				
November	643	...	556,233	436,642,305
December	624	...	572,600	449,491,000
Total	3,868	45	3,801,616	2,984,268,560
Aggregate	17,153	30	11,711,386	14,698,451,954



Fuel oil consumed.....	\$32,095 00
Salaries—Engineers and firemen.....	16,625 57
Consulting engineer	1,140 00
Coal for pumping oil.....	66 47
Printing and stationery.....	18 29
Material—Rags, waste, polish, etc.....	158 61
Material—Valves, gaskets, etc.....	327 49
Repairs—Boilers and machinery.....	612 75
Lubricants	484 97
Horse farrier	8 00
Harness and repairs.....	2 85
Street car tickets.....	10 00
Expenses on electric light.....	66 17
Ice	37 04
Commutator	35 00
Boiler inspection	54 50
Demurrage	2 00
Frames	23 00
Freight and telegrams.....	4 36
	<hr/>
	\$51,772 07

Cost of fuel per million gallons pumped has been \$2.18½, and per million gallons pumped 100 feet high \$1.93. Engines Nos. 1 and 2 were run a good part of the year with pumps single acting.

In figuring the cost there has not been any deduction for heating or lighting.

The tables show that the water pumped during the year was 14,698,451,954 gallons. The total expense for pumping water was \$51,772.07, making the cost per million gallons, \$3.52, which is a good showing considering the increased pressure pumped against and also the increased price of fuel. The average head pumped against has been 116.9 feet, while last year it was only 108.4 feet. In fact, if the price of fuel had remained the same as in 1894, the cost per million gallons pumped 100 feet high would have been only \$1.77½, while in 1894 it was \$2.06. There has therefore been a gain at the engines of nearly 16 per cent.

In the last report I recommended the shutting off of the stand-pipe, so we would be able to get additional pressure, which was badly needed; it was in the first part of June when the experiment was tried, and it has proved to be

more than what we expected, for we are able to run the engines slower than before, when wanted, and we find that one will not interfere with the other as much as before. As we have made some changes in our pumping engines, it will be of no little interest to describe them, as follows:

The changes in the water ends of Engines Nos. 1 and 2 were made so we might be able to work our pumps single or double-acting as the case required, without stopping. By referring to gates marked A B B, on page 92, it will be seen that by opening them, the vacuum in the upper half of both pumps will be destroyed, thereby working the pumps single-acting, the gates B B opening into the air and A being on a by pass between the two pumps. This change has also been supplemented by changing the Stevens cut-off on the high pressure cylinder for the Sickles cut-off, and the effects of these changes on the steam consumption is shown by the indicator cards on page 95, and by the following comparative table for Engine No. 2:

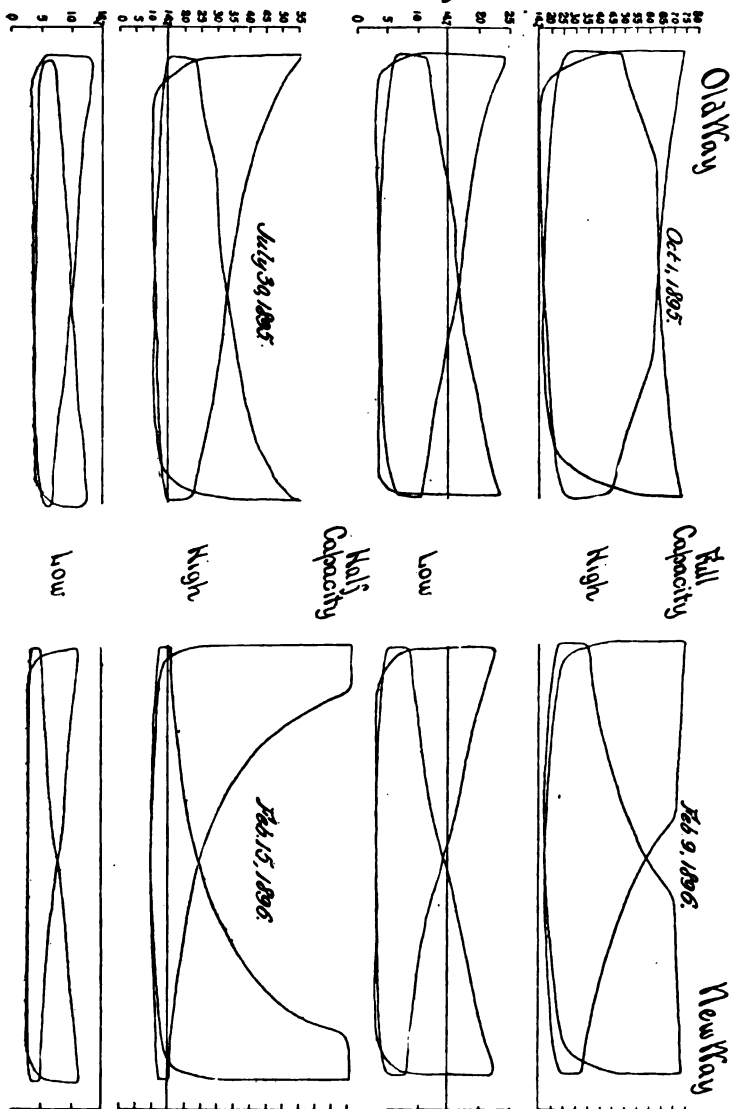
FULL CAPACITY.

<i>Old Way.</i>		<i>New Way.</i>	
October 1, 1895.		February 2, 1896.	
Revolutions per minute..	9½	.....	12
Initial pressure..... 60	lbs.	.....	59½ lbs.
M. E. P.—High, 43.2 lbs.; low, 12.4 "		.....	High, 37.0 lbs.; low, 10.8 "
Vacuum..... 11½	"	.....	11½ "
I. H. P.—High, 248.06;		.....	High, 262.96; low, 259.09..522.05
low, 235.5.....	478.56		
Steam per I. H. P.....	18.09 "	.....	14.88 "
Gain.....		.....	17½ per cent.

HALF CAPACITY.

<i>Old Way.</i>		<i>New Way.</i>	
July 30, 1895.		February 15, 1896.	
Revolutions per minute..	12	.....	10
Initial pressure..... 41	lbs.	.....	56 lbs.
M. E. P.—High, 32.3 lbs.; low, 5.9 "		.....	High, 20.7 lbs.; low, 4.9 "
Vacuum..... 11	"	.....	12 "
I. H. P.—High, 158.48;		.....	High, 122.6; low, 97.93..230.53
low, 141.53.....	300.01		
Steam per I. H. P.....	17.83 "	.....	14.71 "
Gain.....		.....	17½ per cent.

Stroke in all cases 6 feet.



For the case of "full capacity" the only difference in the conditions was that the old way card was taken with the engine running under throttle, which was necessary at times with the Stevens cut-off, and the new way card was taken with the Sickles cut-off, and the throttle wide open.

In the case of "half capacity" in addition to this difference there was a difference in the water ends of the pumps. The old way was to stop the engine, close the inlet gate, pump out the well, take the covers off the suction boxes and the man-hole of one pump, when we would be ready to open the inlet gate and start the engine again, all of which would take considerable time, and when running, one pump would be working double-acting and the other plunger would be working as an idler, churning the water.

All data except the number of revolutions was obtained from the indicator cards.

While these cards, as shown, indicate a gain of $17\frac{1}{2}$ per cent for the new way running full capacity and $17\frac{1}{2}$ per cent running half capacity, it is not to be expected that when all the conditions are taken into account, which must be constant under both ways of working, and the additional loss from condensation with the greater expansion, these percentages can be maintained.

But the figures certainly show that these engines are more economical of steam under the new arrangement than they were formerly and that our improvements have contributed to the economy of operation in other ways than by reducing the quantity of water pumped; it is to be borne in mind that these cards represent in no sense test conditions and that they may be improved in the near future.

All of the engines are in good condition, but Engine No. 3 is yet to be changed as Nos. 1 and 2 have been. With all engines changed, and our new boilers, which will enable us to carry a higher pressure of steam, we expect the benefit will be considerable.

Engine No. 4, built by the E. P. Allis Co., of Milwaukee, had its final test beginning June 21 and ending the 27th.

The official duty of the engine as reported by Mr. George H. Barrus, of Boston, was 142,366,443 foot pounds per 1,000 pounds dry steam for the six-day run, and for a 30-day run he figured that the coal duty would be 127,000,000 foot pounds; the engine was at the time running at its rated capacity of 24,000,000 gallons and did its work nicely.

The work of this engine under every day conditions is also highly satisfactory. From a comparison of the yearly records for the two years past with those of the last month, when the oil supplied to the engines has been measured separately, the following approximate results have been obtained of the performance of this engine and the remodeled old engines:

Average cost of pumping per million gallons 100 feet high:	
With old engines 1895 (corrected for heating, etc.).....	\$1 93
With Engine No. 4.....	1 32
Gain with No. 4.....	31½¢
With old engines, 1894 (no correction for heating, etc.).....	\$2 20
With old engines, 1895 (no correction for heating, etc.).....	\$2 02
Gain with remodeled engines, about.....	9¢
All figured at cost of fuel for 1895.	

The correction for heating and lighting is made because all the steam so used is taken from the boilers supplying the old engines and all the fuel so consumed is therefore charged to them by the uncorrected report of the measured oil burned. The average speed of Engine No. 4 for the period of the above determination of cost was only about three-fourths of contract speed.

The boilers are in fair condition, although but minor repairs have been made on them this year, but the four in the east room will need some slight repairs soon.

The engine house is in the same condition as formerly, but it must be said that the interior is more comfortable since the introduction of the heaters and in appearance it is second to none.

As the Commissioners are contemplating using coal as fuel, the coal sheds and scales will need some repairs.

Respectfully submitted,

URIAH GOULD,

Chief Engineer of Pumping Station.

Office of
Geo. H. Barrus,
95 Milk St., Room 54.

Boston, July 24th, 1895.

Board of Water Commissioners, City of Detroit, Mich., and The Edward P. Allis Co., Milwaukee, Wis.:

Gentlemen—In accordance with your joint request I conducted a six-days' continuous duty trial of the 24,000,000 gallon pumping engine recently erected by The Edward P. Allis Company at the Detroit Water Works, beginning at 10 p. m., June 21st, 1895, and ending at 10 p. m., June 27th, 1895, and I beg to submit the principal results of the same as follows:

Duty based on 1,000 lbs. of dry steam.....ft. lbs.	142,396,443
Number of gallons of water pumped in 24 hours..'	24,345,721

I have estimated from these results the corresponding duty based on 100 lbs. of best anthracite coal, as stipulated in the contract, assuming a fair degree of boiler efficiency when using such coal, and I make the duty for a 24-hour test 134,104,023 ft. lbs., and for a 30-day test 127,398,822 ft. lbs., both of which are in excess of the quantities guaranteed by the builders.

A detailed report of the trial is presented in the accompanying pages. I am,

Faithfully yours,

(Signed) GEO. H. BARRUS.

Copy.

ABSTRACT OF REPORT.

NATURE OF GUARANTEE.

In the contract made between the City of Detroit and the Edward P. Allis Company for this engine, the requirements in the matter of capacity were to the effect that the engine should pump 24,000,000 gallons of water in 24 hours, against a head varying from 116 feet to 135 feet, with a piston speed of 215 feet per minute, or $21\frac{1}{2}$ revolutions per minute. The duty requirements were that on a 24-hour test the engine should give a duty of 130,000,000 foot-pounds for 100 pounds of best anthracite coal, and on a 30 days' continuous test,

with steam at 125 pounds pressure and a head of 120 feet, it should give a duty of 120,000,000 foot-pounds.

Considering that the fuel used at the present time, and likely to be used in the future, is fuel oil and not anthracite coal, it seemed inexpedient to make the duty trial under the conditions strictly imposed by the contract. It was therefore mutually agreed between the Water Commissioners and the builders that the test should be made under the present working conditions of the plant, and that its duration be limited to six days, the principal object in view being the determination of the general performance of the engine in the matter of economy and capacity. From the results thus obtained it was decided to estimate the duty realized under the specific terms required by the contract.

DESCRIPTION OF PLANT.

The plant as a whole embraces the engine, which is of the vertical triple-expansion flywheel type, and a battery of four horizontal return-tubular boilers. With the exception of the oil-burning apparatus, the plant was furnished complete by the Edward P. Allis Company. It is operated independently of the remaining machinery at the water-works, although the water is discharged into the common system. The boilers are operated with oil obtained from the Ohio fields, the so-called Reed burner being employed.

The supply of water for the engine is drawn from a pump well in the yard some 20 feet distant from the engine-house, and it discharges into the same force main which carries the water from the other engines to the city service. The system here used is that of direct pumping, and the speed of the pumps requires to be varied according to the demand. Moreover, it is necessary, owing to the arrangement of the mains and the exigencies of the service, to maintain a higher pressure during the day runs when the demand is at a maximum, than during the night runs when the demand is reduced. The changes of speed which are necessitated by these conditions are made by the attendants of the pumping station, who are constantly on watch for this purpose. In conducting the duty trial, it was necessary to conform to these circumstances, and consequently the conditions as to water pressure, regularity of speed, and other details of the work which bear upon them, could not be maintained throughout the trial at fixed points.

The engine is similar in general features to the Allis engine at the Milwaukee Water Works, which is fully described on p. 321, Vol. XV., of the Transactions of the American Society of Mechanical Engineers.

The boilers are of the usual form of the horizontal return-tubular type, fitted with steam domes. The brick setting differs from the ordinary arrangement owing to the provisions for oil burning. The grates are covered with brick tiling and sand, which is laid over the whole surface with the exception of a strip at the front 4 inches in width. Beneath the grate the space is divided by means of additional tiling placed nearly horizontally, and the air for combustion is made to pass first to the rear end of the ashpit and then forward above the tiling and beneath the grate before entering the 4-inch opening at the front end. By this arrangement the air is somewhat heated before its supply to the furnace, and its quantity is reduced so as to prevent unnecessary excess. At the rear end of the boiler is a hanging bridge wall, and the products of combustion are forced to take a detour beneath it before entering the tubes at the rear end. One burner is provided for each boiler. The burner consists essentially of an injector operated by steam, the oil being supplied to the outside of the steam jet. Both the oil and the steam are regulated by valves. For the purposes of the test the supply of steam for the burners was taken from the other boilers of the pumping station. The steam pressure is regulated by adjusting the burners. During the trial it was maintained at practically a constant point.

THE DUTY TRIAL.

The duty trial embraced a complete performance test of the plant, all of the required data for such a test being obtained excepting the quantity of water actually discharged by the pumps. With the system of distribution here in use it was inexpedient, if not impossible, to measure the water actually pumped, except by reference to plunger displacement, and this was the method adopted. The amount of slip in pumps of this design is extremely small (probably not over 1 per cent), and the quantity computed from plunger displacement may be relied upon for all practical purposes as the actual amount delivered.

In general, the methods followed were in accordance with the recommendations of the Duty Trial Committee of the

A. S. M. E. A preliminary test was run under the working conditions of the plant, and during this test, which lasted six hours, the working temperature of the feed water was determined. On the conclusion of this run the jacket water was turned to waste, and the main duty trial was started. All steam and water connections not concerned in the work of the test were first blanked off. The formal trial commenced at 10 p. m. June 21, and continued without interruption and without stopping the engine until 10 p. m., June 27, or exactly 144 hours. Leakage of water and steam into the two boilers not in use, and leakage of the blow-off cocks, was collected from the main blow-off pipe, and its quantity deducted from the feed water as measured. Other accidental leakages which occurred were measured or estimated, and properly allowed for.

During the progress of the trial the quantity of feed water was determined for the whole period of six days. Observations of the principal instruments, embracing steam gauge, water gauge, revolution counter, and readings referring to them, together with some of the other instruments, were made every 15 minutes during the whole trial. The quantity of oil consumed was determined by weight for the first three days, and by meter for the last three days. The quantity of jacket water was determined by weight for the last three days of the test. The calorimeter showing the quality of the steam was operated for a period of two hours once in every eight hours during the whole run. Indicator diagrams were taken from the steam cylinders every hour. Diagrams were also taken from the high pressure pump cylinder nearly every hour during the day runs, and at the same time from either one or the other of the two remaining pump cylinders. Observations of the remaining instruments were made at intervals of half an hour, and, in some cases, one hour, during the trial.

Further particulars as to the instrument and apparatus used, their location, and the method of obtaining data, are given in the full report.

Results.—The principal data and results of the trial are given in the following tables, the first of which relates to the duty and capacity for the whole six days' run. Table No. 2 refers to the work of the steam cylinders and gives the principal measurements and results obtained from the indicator diagrams. Table No. 3 relates to the friction of

the engine and the consumption of steam by the jackets. Table No. 4 gives the data and evaporative results obtained from the boilers.

Following the tables are copies of representative diagrams and a combined diagram, as already noted, together with a chart giving the number of revolutions for each hour during the whole trial, and the pressure in the force main.

The estimate of duty given by 100 pounds of best anthracite coal on a 24-hour test is based on the assumption that such coal has a calorific value of 13,787 British thermal units per pound of coal, and that the boilers on such a test give an efficiency of 75 per cent, or in other words, that they utilize 10,341 heat units per pound of coal, which corresponds to an evaporation of 10.71 pounds of water from and at 212 degrees. The calorific value of best anthracite coal here given is the mean of two of the best results which the writer has obtained from such coal by the use of his coal calorimeter. The efficiency given is not the best that can be obtained from anthracite coal, but it seems to be a fair percentage to be used for the purpose in view. It is not uncommon for boilers of this class to attain an efficiency of 80 per cent.

The estimate of duty given by 100 pounds of coal for a 30 days' test is based on the assumption that the duty would fall 5 per cent below that realized on a 24-hour test. This difference is ample to cover all the necessary losses due to cleaning fires, blowing off, and other exigencies of a prolonged working trial.

The results obtained on this trial will naturally be compared with those of the celebrated Milwaukee test on an engine which, in respect to the steam cylinders, is almost an exact duplicate. The engine at Milwaukee gave a duty based on 1,000 pounds of feed water of 152,448,000 foot-pounds, and the consumption of dry steam per indicated horse-power per hour was 11.678 pounds. The economy realized on the Detroit engine falls some 7 per cent below that indicated by these figures. A comparison of the records of the two tests shows unmistakably the principal reasons for this difference. The most important of these is the difference in the vacuum in the condenser on the two trials. That at Milwaukee was 13.8 pounds, the temperature of the injection water being 34 degrees, while that at Detroit was 12.4 pounds, or 1.4 pounds less, the tempera-

ture of the water here being 71 degrees. The reduced vacuum counts heavily against the work done by the low-pressure cylinder, being in this case nearly 20 per cent of the mean effective pressure shown by the low-pressure diagrams, and about 7 per cent of the total mean pressure referred to the low-pressure cylinder. In the Detroit engine, owing to less water pressure, the pumps were of larger diameter than those at Milwaukee, and consequently the friction of the engine was increased. According to the records the friction of the Milwaukee engine was 9.2 per cent, while that of the Detroit engine was 10.2 per cent. Furthermore, the Milwaukee engine delivered the water into a reservoir, and the work of the engine was performed under nearly constant conditions of water pressure and speed. In the case of the Detroit engine the head varied from 115 feet to 136 feet, while the engine was proportioned to give the best economy at 120 feet head. This, so far as it acted, was unfavorable to the engine.

It is probable that if the Detroit test had been made in the winter, as was that at Milwaukee, so as to secure the advantage of cold injection water, the vacuum in the condenser would have been equal to that obtained at Milwaukee, and the duty would have been correspondingly increased.

TABLE NO. 1—MAIN DUTY TRIAL.

JUNE 21 TO JUNE 27, 1895.

DIMENSIONS.		
1. Number of water plungers.....		3
2. Diameter of each plunger.....ins.		36
3. Stroke of each plunger.....ft.		5
4. Area of each plunger.....sq. ins.	1,010.87	
TEMPERATURES.		
5. Temperature of water in pump well.....degs.	71.3	
6. Temperature of feed water supplied to boilers, degs.	124.3	
FEED WATER.		
7. Total weight of feed water supplied to boilers, lbs.	1,058,879	
PRESSURES.		
8. Boiler pressure by steam pipe gauge.....lbs.	125.2	
9. Total head expressed in feet.....ft.	123.5	
10. Total head expressed in pounds.....lbs.	53.438	
MISCELLANEOUS DATA.		
11. Duration of trial.....hrs.	144	
12. Total number of revolutions during trial.....	184,172	
13. Percentage of moisture in the steam.....per cent.	0.32	

DUTY AND CAPACITY.

14. Duty based on 1,000 pounds of feed water.... ft. lbs.	141,910,871
15. Duty based on 1,000 pounds of dry steam.... "	142,366,443
16. Duty based on 1,000,000 heat units..... "	129,661,871
17. Estimated duty based on 100 pounds best anthracite coal for a 24-hour test..... ft. lbs.	134,104,023
18. Estimated duty based on 100 pounds best anthracite coal for a 30 days' test..... ft. lbs.	127,396,822
19. Capacity or number of gallons of water discharged in 24 hours..... gals.	24 345,721

TABLE NO. 2. —DATA AND RESULTS PERTAINING TO STEAM CYLINDERS.

JUNE 21 TO JUNE 24, 1895.

DIMENSIONS.

1. Diameter of high-pressure cylinder..... ins.	28
2. Diameter of intermediate cylinder..... ins.	48
3. Diameter of low-pressure cylinder..... ins.	74
4. Diameter of piston-rods, two for each cylinder, ins.	4
5. Length of the stroke..... feet	5
6. Clearance of high-pressure cylinder..... per cent.	1.4
7. Clearance of intermediate cylinder..... per cent.	1.5
8. Clearance of low-pressure cylinder..... per cent.	0.8
9. Ratio of volumes.....	1, 2.978, 7.108

DATA AND RESULTS.

10. Duration	hrs.	72
11. Total weight of feed water consumed..... lbs.	518,811	
12. Weight of feed water consumed per hour..... lbs.	7,205.7	
13. Dry steam consumed per hour..... lbs.	7,182.7	
14. Indicated horse-power developed by high-pressure cylinder	H. P.	191.3
15. Indicated horse-power developed by intermediate cylinder	H. P.	176.04
16. Indicated horse-power developed by low-pressure cylinder	H. P.	206.39
17. Indicated horse-power developed by whole engine,	H. P.	573.73
18. Average steam-pipe pressure..... lbs.	125.6	
19. Average pressure in first receiver..... lbs.	30.3	
20. Average pressure in second receiver..... lbs.	0.8	
21. Average vacuum in condenser..... lbs.	12.4	
22. Atmospheric pressure by barometer..... lbs.	14.7	
23. Average revolutions per minute.....	20.99	
24. Mean effective pressure, high-pressure cylinder, lbs.	49.85	
25. Mean effective pressure, intermediate cylinder, lbs.	15.4	
26. Mean effective pressure, low-pressure cylinder, lbs.	7.57	
27. Dry steam consumed per indicated horse-power per hour	lbs.	12.519
28. Dry steam consumed per indicated horse-power per hour by jackets..... lbs.	1.59	
29. Dry steam consumed per indicated horse-power per hour, exclusive of steam used by the jackets	lbs.	10.929
30. British thermal units consumed per indicated horse-power per hour	13,600	
31. British thermal units consumed per indicated horse-power per minute	228.3	

MEASUREMENTS AND COMPUTATIONS BASED ON SIX SETS OF
SAMPLE DIAGRAMS.

	H. P. Cyl.	Int. Cyl.	L. P. Cyl.
32. Pressures in steam pipe and receiver, lbs	125.7	30.1	0.98
33. Initial pressure above atmosphere...lbs.	124.29	30.41	0.20
34. Cut-off pressure above zero .....lbs.	134.1	38.29	11.54
35. Release pressure above zero.....lbs.	44.73	14.33	5.82
36. Compression pressure above zero.....lbs.	46.8	15.76	2.95
37. Mean effective pressure	50.07	15.41	7.59
38. Back pressure at mid-stroke above or below atmosphere .....lbs.	+29.44	-0.019	-11.86
39. Proportion of forward stroke completed at cut-off .....	.338	.362	.479
40. Proportion of forward stroke completed at release .....	.906	.998	.969
41. Proportion of backward stroke uncom- pleted at compression.....	.012	.009	.013
42. Steam accounted for at cut-offs.....lbs	9.484	9.53	9.45
43. Steam accounted for at release.....lbs.	9.96	9.97	9.91
44. Proportion of steam consumed exclusive of jacket steam, accounted for at cut- off .....	.868	.872	.865
45. Proportion of steam consumed exclusive of jacket steam, accounted for at re- lease .....	.911	.912	.907

TABLE NO. 3.—MISCELLANEOUS RESULTS.

FRICTION.

1. Indicated horse-power developed by steam cylinders during the first three days.....H. P.	573.73
2. Horse-power computed from pressure shown by gauges on force main and suction main during the first three days .....H. P.	515.41
3. Power absorbed by friction of engine.....H. P.	58.32
4. Percentage of friction.....per cent.	10.2
5. Mean effective pressure measured from pump dia- grams .....lbs.	57.05
6. Corresponding head shown by gauges on force main and suction main expressed in pounds.....lbs.	55.51
7. Loss of head between pump cylinders and mains ex- pressed in pounds.....lbs.	1.54
8. Percentage of friction between pump cylinders and mains referred to power developed in the steam cylinders .....per cent.	2.5

JACKET STEAM.

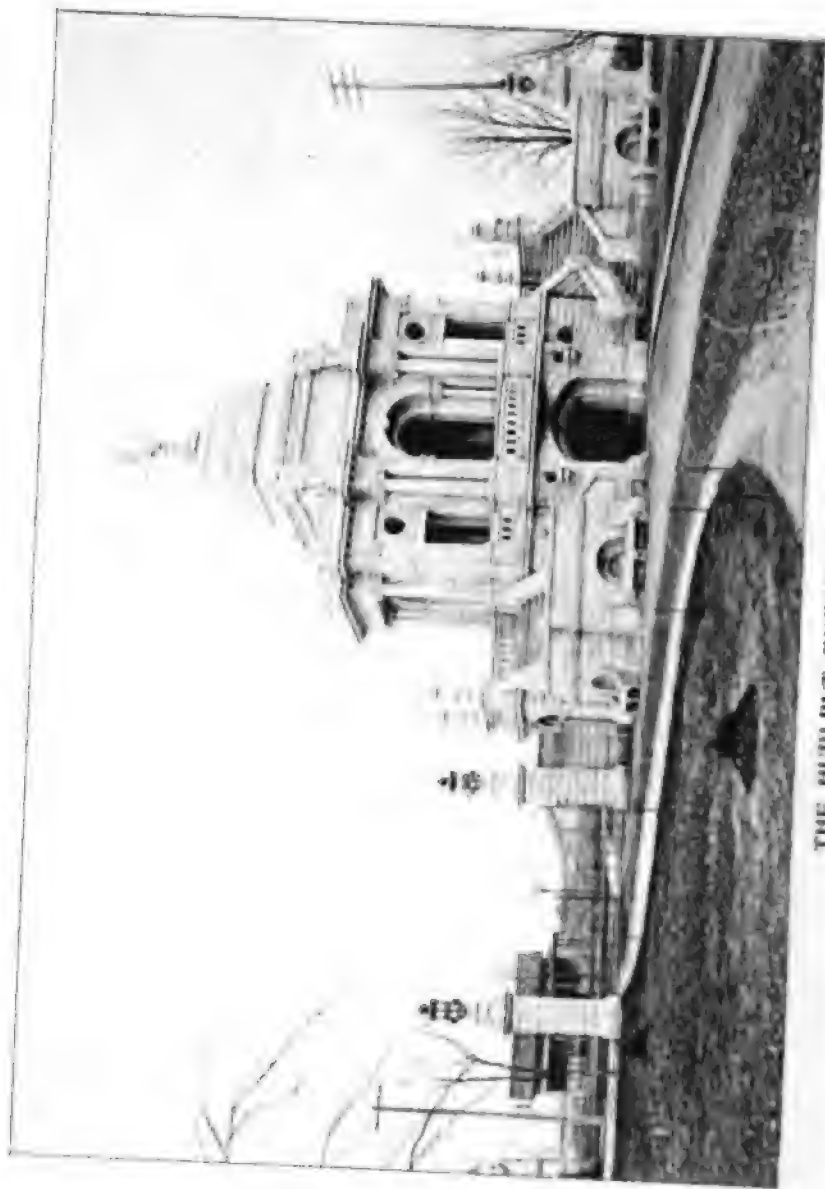
9. Total weight of water supplied to boilers during last three days uncorrected for moisture in steam...lbs.	540.068
10. Total weight of water drained from jackets during last three days .....lbs.	68.755
11. Percentage of total steam condensed in jackets, per cent.	12.7
12. Weight of steam condensed in jackets per hour, lbs.	954.9
13. Average steam pressure in low-pressure jacket last three days .....lbs.	45.8
14. Average steam pressure in low-pressure jacket for whole trial .....lbs.	46.1

15. Weight of steam condensed per hour in jackets with engine at rest	lbs.	163.5
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TABLE NO. 4.—DATA AND RESULTS OF BOILER TEST WITH FUEL OIL, FIRST THREE DAYS.

DIMENSIONS.		
1. Number of boilers.....		2
2. Diameter of each shell.....	ins.	62
3. Length of each shell between heads and length of tubes	ft.	20
4. Number of tubes 4 ins. in diameter, each boiler....		49
5. Area of heating surface, two boilers.....	sq. ft.	2,304
TOTAL QUANTITIES.		
6. Duration	hrs.	72
7. Weight of fuel oil consumed.....		40,164
8. Number of gallons of oil consumed.....	gals.	*5,656.9
*No deduction made for moisture. It is assumed that the steam leaving the boilers was dry.		
9. Cost of oil at 1.56 cents per gallon.....		\$88.24
10. Weight of water evaporated (including steam used by calorimeter)	lbs.	519,581
HOURLY QUANTITIES.		
11. Weight of oil consumed per hour.....	lbs.	557.8
12. Water evaporated per hour.....	lbs.	7,216.5
13. Equivalent evaporation per hour, feed 100 degrees, pressure 70 pounds	lbs.	7,382.5
14. Horse-power developed, A. S. M. E. basis of 30 pounds	H. P.	246.1
15. Equivalent evaporation per square foot of heating surface per hour.....	lbs.	3.2
AVERAGES OF OBSERVATIONS, ETC.		
16. Average boiler pressure	lbs.	126.2
17. Average temperature of feed water.....	deg.	85.3
18. Average temperature of flue gases.....	deg.	479.4
19. Average draft suction	in.	.37
20. Percentage of moisture in steam at engine, per cent.		0.32
21. Weather and outside temperature.....	Fair, warm.	
22. Calorific value of oil per pound by chemical analysis	B. T. U. 21,200	
RESULTS.		
23. Water evaporated per pound of oil from actual temperature and pressure	lbs.	12.934
24. Water evaporated per pound of oil from temperature of 121 degrees	lbs.	13.396
25. Equivalent evaporation per pound of oil from and at 212 degrees.....	lbs.	15.218
26. Efficiency	per cent.	60.3

Note. No allowance is here made for steam used by the burners which was supplied by the other boilers. As elsewhere noted, it was found to be $4\frac{1}{2}$ per cent. of the quantity used by the engine. The cost of oil corrected for this amount becomes 92.22, and the evaporation per pound of oil from a temperature of 124.3 degrees, 12.82 pounds.



THE HUBERT MEMORIAL GATEWAY.

REPORT OF THE SUPERINTENDENT OF GROUNDS.

To the Honorable Board of Water Commissioners :

Gentlemen—In the philosophy of life, the having done our full duty to-day, ought to bring contentment. But will it?

In these later days, the most energetic men in the fields of art and science strive to reach the very top notch of their ambition, and then are not entirely satisfied, and find satisfaction only in the thought that Rome was not built in a day.

Detroit, beautiful as she is, with her broad avenues, beautiful parks and boulevards, magnificent buildings, endowed by nature with beautiful surroundings, is not yet finished, but is only just begun. Thousands of years hence, when the work is far advanced, perhaps those in charge will then think as we do to-day, there yet remains much to do.

Considering the short time since the improvements of the Water Works Park began, I think we should be well pleased with the progress made.

The thousands of visitors from other parts of the country join with our own citizens in expressing themselves as delighted with the Park.

The improvements now under way, and which are likely to be completed before next season is far advanced, will, in my opinion, add more to the beauty of the Park than any former improvement. Taking down the basin fence and filling in an earth embankment between the basin and canal, in place of the old dock, will have telling effect.

The planting of large trees in the southerly part of the

Park will afford much needed shade, and besides give age and finish to what was a short time ago only marsh land.

The cutting off the piling and lowering all timber below the water, and covering about seven feet of the slope on the west canal bank with cobble stones nicely laid, is an improvement worthy of mention, providing Uncle Sam can be persuaded to stop the drainage of the Great Lakes, which is continually lowering the water level.

Another improvement which will be very much appreciated is the toilet room for ladies.

The improvements now most needed, which I hope your honorable body will soon order, are one team and two foot bridges across the winding canal. Also a good greenhouse, as the houses we now have are propagating houses, and we use every foot of them for growing the class of plants known as bedding plants.

If we had a properly constructed greenhouse that would be ornamental as well as useful, we could have on hand a class of plants we now have no room for, such as palms and other tropical plants; also roses, carnations, etc., which would be an attraction all the year through.

I am glad to say the proper earnings of the Hurlbut estate will likely be sufficient to pay the ordinary expenses of the Park, so that whatever pleasure and satisfaction the people get from the Park will be absolutely free of cost to them. In conclusion would say our stock of bedding plants is in fine condition and we hope to make a floral display next season that will be satisfactory.

I enclose an inventory of the movable property on hand in this department of the value of \$1,400.05.

Very respectfully,

E. A. SCRIBNER,
Supt. Grounds

REPORT OF THE SUPERINTENDENT OF EXTENSIONS.

Detroit, Michigan, January 2, 1896.

To the Board of Water Commissioners :

Gentlemen—In accordance with the regulations of the Board of Water Commissioners, I have the honor of presenting to you my annual report, relative to the general condition and progress of the work in this department.

It will be seen by the records of this office that the extensions of the year just closed were less about 16 miles than for the previous year, but if we take into consideration the fact that $2\frac{3}{4}$ miles of 42-inch main have been laid the past year, the magnitude of this work as compared with smaller lines with the extra labor necessary thereto, greatly compensates for the shortage in mileage.

The extensions of the past year for the replacing of smaller lines of pipe with pipe of larger size, have been about 4 miles only, or about one-third of the length for the year previous, and were largely recommendations of that year, but which were not completed until the past season.

At the close of the year 1894, quite an extensive call was made upon your honorable body by the Park and Boulevard Commissioners, for an extension of distribution pipes along the boulevards; the call covered a distance of about $3\frac{3}{4}$ miles. The desire of the said Board was, that a system of pipeage might be laid to which hydrants could be attached, and set about 600 feet apart, for the sprinkling of the lawns and driveways. There being no water-takers along these proposed lines to be laid, it became necessary, in accordance with the regulations of your honorable body, to impose a bonus, which should cover a certain per cent of the cost

as an inducement to lay the lines of pipe as called for. To meet this an agreement was had, that all common labor necessary for the excavating and back-filling of the pipe trenches should be furnished by that body, the supervision and pipe-laying, including all pipe and materials for the laying of these lines should be met by your honorable body. This agreement being satisfactory, the work was commenced the early part of January of the year just closed. In meeting this call, provision was made by the Engineering Department as to size and location of the same for future use.

In addition to the above, 2,844 feet of 4-inch pipe was laid for the said Park Board for the connecting of their hydrants along the entire boulevards, the total cost of which was met by the same.

NEW LINE OF 42-INCH FORCE MAIN.

The past year has witnessed the completion of this third line of 42-inch main. This makes the third main of this size conveying the supply of water to the city from the pumping works, making a combined area of 72 $\frac{3}{4}$ inches in diameter or a daily capacity of 75,000,000 U. S. gallons. This would seem a sufficiency for some time to come.

Work on the above mentioned main was commenced about the middle of April, working from inside of the grounds of the pumping works and running westerly along Jefferson avenue to Crane avenue, up to which point the line was completed, and from this point the gangs were taken to the westerly end of the line at Champlain and Chene streets, commencing operations working easterly to Crane avenue.

This line was as vigorously prosecuted as opportunity would permit. The section of the line from inside of the pumping works grounds and along Jefferson to Crane avenues, and from this point through private property to Iroquois avenue, a distance of 3,750 feet; the trench was excavated to an average depth of 14 feet. The reason for this excessive depth was to allow this section of the line to

pass underneath the lower or No. 1 42-inch force main and to give sufficient clearance for basement excavations, should it be required to build over where this section of the said main lays.

This line was connected to the 30-inch main in Chene street, at which point a section of the 30-inch main was cut out, and a 42x42-inch Y branch, with 42x30 inch reducers, and a 30-inch gate was inserted; thence from this branch, making an easy radius crossing Champlain street from north to south, the lines then run easterly along the south side of the roadway. From this point to Baldwin avenue the street is paved and on which the Fort Wayne & Belle Isle Company car tracks are laid; coupled with this the contracted width of the street, which is not over 50 feet in width, made quite a formidable obstacle in our way while at work on this line, the traffic of the road being kept open. This section equals about 55 per cent of the entire length, and had it not been for the kind courtesy of the said company and their superintendent of construction, Mr. Hazard, allowing us the use of the south car track, between Elmwood and Baldwin avenues, between which points a double track is laid, it would have been an utter impossibility to have prosecuted the work without a greatly added expense. Notwithstanding this additional space, rendered us by the use of this track, we found our hands full in pushing the work in an expeditious manner. I think I may be at liberty to say right here that it is only just to Mr. August Meike and his corps of assistants having charge of this work to say that in all of the handling of this heavy work not a single accident occurred worthy of mention. To this line 35 branches were set for cross street connections and to which every street having distribution pipe in have been connected, three of the branches have an outlet of 24 inches in diameter; these branches are to connect with the lower or No. 1 42-inch force main that are set at Mt. Elliott, Bellevue and Crane avenues; the one at Crane avenue being connected, the other two will be at some future date.

To this line and along its entire length, including the pumping works grounds, 13 42-inch water gates are set. One of these is a Murdock and 12 the Michigan Brass & Iron Works make.

The apportionment of the length of this line and its location through which it is laid is as follows:

In pumping works grounds, including all connections, 865 feet, or 6 per cent of total length.

Jefferson avenue, from 266 feet west of Cadillac to Crane avenue, 2,109 feet, or 15 per cent of total length, unpaved section.

In line of Champlain street, through private property from Crane to Iroquois avenue, 1,135 feet, or 8 per cent of total length.

Champlain street, from Iroquois to Baldwin avenue, 2,315 feet, or 16 per cent of total length, unpaved section.

Champlain street, from Baldwin avenue to Chene street, 7,879 feet, or 55 per cent of total length; this last section is paved and upon which the tracks of the Fort Wayne & Belle Isle Company are laid.

The principal lines laid in addition to the above 42-inch mentioned were as follows:

Fort street, from Seventh to Tenth street, 12-inch replacing 6-inch pipe; to this a new line of 8-inch in Eighth street and Trumbull avenue were connected; also the 8-inch line in Tenth street. A 12-inch line was laid in Porter street, from the 24-inch main in Tenth street to Fourteenth avenue, and from this point a line of 10-inch was laid to Twentieth street, and still westward in said street an 8-inch line of pipe was laid to Twenty-second street, several short lines of 3 and 4-inch pipe were replaced by the laying of the above.

A 10- and 12-inch line of pipe were laid in Burns avenue, the 10-inch being laid from the lower 42-inch main in Jefferson avenue to the new line of 42-inch main in line of Champlain street, the 12-inch from the new 42-inch main to St.

Paul avenue; this line connects the two 42-inch mains at this point.

A 10-inch line of pipe was also laid in St. Aubin avenue from North Boulevard to Clay avenue, this line connects with the 24-inch in said Boulevard.

Frontenac Boulevard, a line of 10-inch was laid on the east side from Mack to Gratiot avenue, and in Hendrie Boulevard, a line of 8- and 10-inch was laid from Collins street 30-inch main to the Frontenac Boulevard, the 10-inch being between Collins street and Mt. Elliott avenue and the 8-inch from this point to Frontenac Boulevard; to the above, all streets crossing the same where pipe had been previously laid were connected.

An 8-inch pipe was also laid in Alfred street from Woodward avenue to John R. street, replacing a 4-inch line. The same size pipe was also laid in Eighth street from River street to Michigan avenue, several short sections of 4-inch were replaced by this. A line of 8- and 6-inch was also laid in Iroquois avenue from the new 42-inch main in Champlain street to St. Paul avenue. The same size was also laid in Joseph Campau avenue, from Catherine to Jay streets; also in Kercheval avenue from Mt. Elliott to Beaufait avenues, this replaced a 4-inch pipe; a short section of 8-inch pipe was laid in Leib street from the new 42-inch main in Champlain street to Monroe avenue, replacing 3-inch pipe; a line of 8-inch was also laid in Maybury avenue, from north of Warren to Stanley avenues; a short section of 8-inch pipe was laid in alley south of Monroe avenue east of Beaubien street; a line of this size was also laid in Park street, from Columbia to Bagg streets, replacing 4-inch pipe, this line connects with the 24-inch main in Bagg street and the 16-inch at the intersection of Park and Columbia streets; a 6-inch pipe was also laid in said street from Bagg to Peterboro streets, replacing 4-inch pipe; an 8-inch pipe was laid in Seminole avenue, from Agnes to St. Paul avenue; also an 8-inch in Trumbull avenue, from Fort street to Michigan avenue, this line connects with the 24-inch main in Abbott

street, and the new line of 12-inch in Fort street; also the 8-inch line in Michigan avenue; 8-inch pipe was also laid in alley west of Woodward avenue as follows: alley north of Jefferson avenue to Larned street, Congress street to alley south of Fort street, and from alley north of Michigan avenue to Clifford street.

The above comprises the principal lines laid, the minor lines with the above appear in the attached list of pipe laid.

PIPEAGE.

The amount of distribution pipe and mains laid and relaid also for private use, and small lines of pipe discontinued during the past year, makes the sum total as follows: Total pipe laid $22\frac{1}{8}\frac{1}{8}\frac{1}{8}$ miles, of which 150 feet were relaid; 1,822 feet for private use and 444 feet laid for blow-offs to connect to sewers; $4\frac{1}{8}\frac{1}{8}\frac{1}{8}$ miles of pipe discontinued, making the net increase of the pipeage $18\frac{1}{8}\frac{1}{8}\frac{1}{8}$ miles. with the works will make the total length $501\frac{1}{8}\frac{1}{8}\frac{1}{8}$ miles. This amount added to the measured line of pipe connected miles, which in detail is as follows:

SIZE OF PIPE IN INCHES.	MEASURED LENGTH IN FEET FOR 1894.	ADDED LENGTH IN FEET FOR 1895.	DISCONTINUED LENGTH IN FEET FOR 1895.	TOTAL LENGTH IN FEET FOR 1895.
45	103			103
42	45,207	14,802		59,509
36	715			715
30	49,837		22	49,815
24	84,813	28		84,841
20	461			461
18	87			87
16	45,237			45,237
12	12,119	4,899		17,018
10	128,584	9,100		137,684
8	257,436	21,054		278,490
6	1,048,453	59,154	3,984	1,108,673
4	801,100	9,175	15,488	794,787
3	73,257	175	2,046	71,386
2	2,820			2,820
Total,	2,550,729	117,887	21,490	2,646,126

Of the pipe laid as appearing in the above mentioned Table of Pipeage, $1\frac{40}{111}$ miles was laid beyond the city limits, 1,122 feet of which was 4-inch and 4,218 feet of 6-inch pipe; this will appear in the list of pipeage. The total cost of which was met by the petitioners asking for these extensions.

You will see by the perusal of this report no mention is made of log pipe being yet in use, practically it is out; the line in alley north of Grand River avenue, from Lincoln avenue to alley west of same is dead, and that in the abandoned section of Holden avenue, between Second and Third avenues, is still left temporarily in use, two or three service connections still taking supply from it until pipe shall be laid in new location of street.

The following is a table of pipeage as arranged by wards:

TABLE OF PIPEAGE AS ARRANGED BY WARDS

WARD.	4-IN.	6-IN.	8-IN.	10-IN.	12-IN.	16-IN.	20-IN.	24-IN.	30-IN.	36-IN.	48-IN.	60-IN.	72-IN.	84-IN.	96-IN.	108-IN.	120-IN.	144-IN.	180-IN.	216-IN.	288-IN.	360-IN.	TOTAL.	
First.....	68,001	68,970	84,563	89,478	2,600	15,573		6,754	3,984		3,349									6,394		816,404	1,771	6,848
Second.....	44,641	43,516	12,960	19,771	564	8,194		5,913	4,184											3,175		148,994	4,048	8,949
Third.....	38,447	42,301	9,448	8,965	1,983	3,364		4,545	3,399		1,679									4,962		117,576	1,718	8,814
Fourth.....	63,044	58,479	6,848	4,335		3,555		5,323	3,353											6,387		151,115	726	9,484
Fifth.....	56,777	37,794	10,074	9,720	986	2,491		3,678	2,513		1,749									4,305		119,996		1,408
Sixth.....	46,031	39,656	19,344	5,944	2,486	1,565		5,463	3,535											5,322		128,304	4,051	9,543
Seventh.....	44,705	35,650	19,396	3,576	2,514	802		405	11,365	3,083	1,859									2,598		115,800		908
Eighth.....	48,097	57,879	31,656	161	2,372			8,377	2,153											7,966	175	146,736	912	4,018
Ninth.....	58,788	68,895	12,622	5,433	1,815	3,430		2,433	12,041	715	3,401									6,907		176,431	38	1,686
Tenth.....	81,172	83,408	18,612	8,907	280			10,967	2,443											4,431		210,160	666	4,513
Eleventh.....	57,082	56,950	8,656	3,638	30			1,463			4,955									6,597	16	137,377	355	4,318
Twelfth.....	39,890	73,082	20,540	3,951	16	140	87	55	7,006	2,566										2,562		141,919	895	6,586
Thirteenth.....	61,532	59,732	8,402	5,002	54			513	7,173		9,932									6,704		159,118	1,393	10,600
Fourteenth.....	34,975	97,999	22,568	5,341		2,695		11,302	1,013											3,119	160	178,947		4,353
Fifteenth.....	39,141	159,647	34,185	13,070	1,499			38												712	313	286,973	5,990	86,566
Sixteenth.....	38,916	108,116	18,844	10,772		2,333														1,718		164,905		1,931
Outside city limits.....	4,697	31,398	7,734																	80		44,000		8,068
Totals in Feet.....	794,797	1,108,673	578,460	137,664	17,016	43,387	87	461	84,841	49,315	713	59,509	108	2,680	71,395	554	2,648,690	28	440,117	887				

It may be of interest to give the location of a number of new streets that have been added to the city, and in which distribution pipe has been laid. The following are the names and locations:

Adele street, west of Chene street.

Burlingame avenue, Woodward avenue to Hamilton Boulevard.

Burns avenue, Jefferson to Kercheval avenue.

Burrell place, Maybury to east of Sullivan avenue.

Chase street, south of River street, outside city limits.

Eastern avenue, east of Twenty-sixth street.

Greeley avenue, north of Alger avenue.

Gillett street, east of Greeley avenue.

Iroquois avenue, Jefferson to Kercheval avenue.

Lawrence avenue, Woodward avenue to Hamilton Boulevard.

Le May avenue, north of Jefferson avenue, outside city limits.

Maxwell avenue, Jefferson avenue to Tonti street.

Moore place, east of Twenty-sixth street.

Newport avenue, north of Jefferson avenue, outside city limits.

Rolf place, north of Mack avenue.

Rollins street, east of Wesson avenue.

Seminole avenue, Jefferson to Kercheval avenue.

Stephens avenue, north of Gratiot avenue.

St. Clair avenue, south of Jefferson avenue.

The following table gives a lucid statement of the average cost of each size of pipe and main as laid, also cost per foot and pro rata of per cent of total cost, of the entire extensions, for the past season's work:

TABLE OF PRO-RATA OF PER CENT. OF TOTAL COST, COST PER FOOT, AND TOTAL COST OF EACH LINE, AS LAID THE PAST YEAR:

SIZE OF PIPE IN INCHES	PER CENT. OF TOTAL COST	TOTAL COST OF EACH SIZE OF PIPE LAID	TOTAL LENGTH IN FEET	COST PER FOOT.
42	75.3	\$245,199.942830	14,802	\$11.5400
36	24.7	600,000.000000	28	00.0000
30	15.6	7,772.703192	4,899	1.5870
24	10.8	11,538.068978	9,100	1.2677
18	7.2	18,351.094204	21,054	.8670
12	4.8	39,478.445010	59,154	.6678
8	3.2	3,714.171462	9,175	.4048
6	2.2	49,194.324	175	.2800
TOTAL		\$245,971.620000	117,887	

The cost of 24-inch pipe was laid in connection with the 42-inch force main, the estimated cost of which is set at \$11.54 or \$4.7835 per foot; this amount is deducted from the total cost of the 42-inch main in making the estimated cost per foot, as appearing in the table of cost.

On the following pages will be found the Tables of Gates, giving number and size in use, number set the past year, number taken out and number reset either for stop or break offs.

I take the liberty of giving a description of the 42-inch hydraulic pressure gates that have been set in the new line of force main; these gates were made by the Michigan Brass & Iron Works, of this city, and from the general appearance of the same and the apparent good workmanship they have much to recommend them as to quality.

42-INCH HYDRAULIC PRESSURE GATES.

The water gates set in the new line of 42-inch main are operated by hydraulic pressure. They differ from the ordinary kind now in use on our system, in that the screw spindle is replaced by a single piston rod with piston head secured to its outer end, the inner end being secured to the disks; a cylinder is attached to the body of the gate allowing sufficient space between body of gate and inner head of cylinder for stuffing boxes and glands, the gates laying horizontally. The cylinder has a diameter of sufficient area to overcome the friction due the pressure of the water in the mains upon the disks of the gates. Each gate has an 8-inch by-pass attachment, also a blow-off gate opening on under side of valve or disk chamber, for the displacement of whatever of sediment may accumulate at this point, and that would in any way impede the free working of the same. We hope by this method to be able to operate the opening and closing of the valve with less labor and time.

A question arises, however, that when the same has been in use for several years and the lime formation which appears upon the spindles and disks of the water gates, after continued use (which is the chief cause of the gates working hard), will not be the same with the hydraulic piston arrangement. For operating the working of these gates, the men in charge of this department will have to enter the gate wells for working the same, and to see when opened or closed. The gates have a 1½-inch pipe attachment to either end of cylinder, leading from both sides of the by-pass gate, from which the pressure is applied to the cylinder and to which may be connected any other of the pipeage should it become necessary to do so when the pressure in the force mains is dead. Should we find it still requiring a greater pressure than that upon the mains and distribution pipes to operate the gates, an appliance is had by the attachment of a small pressure pump which will in any event accomplish the purpose intended by this arrangement.

Since preparing this report the 42-inch hydraulic pressure gates have been properly connected to the adjoining main by the attachment of the small pipes for applying the water pressure to the cylinders. The result thus far in operating the gates by hydrostatic pressure is very satisfactory, the time we took in operating the disks was about six minutes, three minutes each way, the pressure being on the main in which the said gates are set from the smaller lines, the direct pressure from the Pumping Works being not yet applied. The closing of the gates may be operated in much less time if so desired by a freer injection of the water into the cylinders. Any greater acceleration of speed than this may, under some conditions, prove to be very disastrous; the quick closing would in all probability cause serious rupture to the mains, but a little common sense will avoid all of this by simply adjusting the discharge leading to and from either end of the cylinder to such a degree that the disks shall not be propelled too rapidly.

I have thought it wise to mention at this point of the report that in speaking of the force mains, I have mentioned the lower as No. 1 main and the line just completed as the new line. Prior to this the line of mains in use conveying the supply to the city have been designated the upper and lower. Now seeing that the said new line is virtually a lower or dual line, would it not now be better to distinguish them by numbering them Nos. 1, 2 and 3 respectively?

TABLE OF NEW GATES SET FOR SHUT-OFFS.

No. of each kind.	NAME OF GATE.	SIZE.	REMARKS.
1	Murdock Valve Company.....	42-in.	Set for Shut-off.
8	" " "	12-in.	" "
13	" " "	10-in.	" "
34	" " "	8-in.	" "
33	" " "	6-in.	" "
34	" " "	4-in.	" "
9	" " "	4-in.	Set for Blow-off.
10	Michigan Brass and Iron Works.....	42-in.	Set for Shut-off.
1	" " "	30-in.	" "
2	" " "	24-in.	" "
3	" " "	12-in.	" "
4	" " "	10-in.	" "
62	" " "	8 in.	" "
3	" " "	8-in.	Set for Blow-off.
151	" " "	6-in.	Set for Shut-off.
15	" " "	6-in.	Set for Blow-off.
9	" " "	4-in.	Set for Shut-off.
6	" " "	4-in.	Set for Blow-off.
398	Total.		

TABLE OF OLD GATES RESET FOR SHUT AND BLOW-OFFS.

No. of each kind.	NAME OF GATE.	SIZE.	REMARKS.
1	Flowers Bros.....	6-in.	Set Shut-off.
12	" "	4-in.	" "
29	" "	4-in.	Set Blow-off.
6	" "	4-in.	Reset Blow-off.
1	Murdock Valve Company.....	6-in.	" "
5	" " "	4-in.	" "
1	Galvin Bros.	4-in.	" "
1	" "	4-in.	Set Blow-off.
2	Ludlow.....	4-in.	Reset Blow-off.
2	Pittsburgh	4-in.	" "
80	Total.		

TABLE OF GATES TAKEN OUT.

No. of each kind.	NAME OF GATE.	SIZE.
1	Michigan Brass and Iron Works.....	6-in.
1	" " " "	4-in.
1	Eddy	24 in.
8	Flowers Bros.....	6-in.
13	" "	4-in.
8	Galvin Bros.....	4-in.
2	Ludlow.....	4-in.
7	Murdock Valve Company.....	6-in.
44	" " " "	4-in.
4	Pittsburgh	4-in.
1	Scowden.....	8-in.
85	Total.	

GATES IN SYSTEM TO JANUARY 1st, 1896.

	42-In.	36-In.	30-In.	24-In.	20-In.	18-In.	16-In.	12-In.	10-In.	8-In.	6-In.	4-In.	3-In.	TOTAL	PER CENT.
Murdock	5	...	11	16	...	...	24	27	167	435	1,432	1,225	9	3,401	58.087
Flowers	20	...	10	18	...	...	...	...	39	52	241	447	22	849	14.500
Galvin Bros.....	...	1	7	12	...	...	21	...	12	32	171	268	1	525	8.967
Michigan Brass and Iron Works..	10	...	1	2	10	...	7	8	26	87	502	107	...	760	12.980
Pittsburgh.....	...	...	...	13	...	2	1	1	9	11	31	129	...	197	3.865
Eddy.....	...	...	...	...	...	...	...	...	15	4	6	9	...	34	0.580
Scowden.....	...	...	...	...	...	...	...	...	3	2	...	...	...	5	0.086
Ludlow.....	...	...	...	...	...	...	...	...	1	3	11	13	...	28	0.478
Prong.....	...	...	...	...	...	...	...	...	...	...	1	...	...	1	0.017
Boston.....	...	...	...	...	...	...	...	...	...	1	1	...	...	2	0.034
Newport.....	...	...	...	...	...	...	...	...	...	...	...	1	...	1	0.017
No Name.....	...	...	...	...	...	...	...	...	...	8	9	39	1	52	0.889
TOTAL.....	35	1	29	61	10	2	53	36	272	630	2,455	2,238	33	5,855	100.000

The last mentioned table gives the total number of water-gates in the pipeage system, name of maker, number of each size and percentage of each manufacture. The following table gives the length of 3, 4, 6 and 30-inch pipe which have been replaced with pipe of larger size, in detail as follows:

SIZE OF PIPE LAID.	SIZE OF PIPE REPLACED.	LENGTH OF PIPE LAID.
6-inch iron pipe.....	3-inch iron pipe.....	781 feet.
6 " " " ".....	4 " " " ".....	4,814 "
6 " " " ".....	6 " " " ".....	131 "
8 " " " ".....	3 " " " ".....	970 "
8 " " " ".....	4 " " " ".....	6,545 "
8 " " " ".....	6 " " " ".....	300 "
10 " " " ".....	4 " " " ".....	430 "
12 " " " ".....	4 " " " ".....	419 "
12 " " " ".....	6 " " " ".....	1,226 "
42 " " " ".....	4 " " " ".....	3,567 "
42 " " " ".....	6 " " " ".....	2,097 "
42 " " " ".....	30 " " " ".....	23 "
TOTAL.....		21,195 "

PUMPING WORKS.

We are now at work at this point making our final connections with the two lines of force mains and the four engines. When this is completed with all the attendant alterations, the arrangement of this system of force mains will be very complete, working conjointly with or independent of each other. I may add of the above, that had it not been for the unfavorable weather and other causes which I had no control of, I should have been able to report its completion at the incoming of the new year. I hope, however, nothing preventing, I shall be able to report its completion by the next session of your honorable body.

WATER-GATE DEPARTMENT.

The complications incident to this branch of the work and the necessary skillful handling required of the same has

been very satisfactorily met under the efficient supervision of Mr. John Bridge and the men in his immediate employ. For the detailed items of this department see appended report.

OFFICE OF EXTENSION DEPARTMENT.

The profusion of clerical work of this department under the efficient supervision of Mr. A. W. Goodsell and his corps of assistants will make a very satisfactory showing of the completeness of the records as kept in this department of the works.

In conclusion, I am pleased to say as in my former report that it would be a breach of courtesy not to mention your kindness and forbearance of the many calls we have had to make upon your attention. I am also pleased to say that the co-operation with the several departments of the works has been of a pleasant character.

Transmitted with this report is an inventory of tools, pipe and specials, office equipments and locations of the pipeage of the city to January 2, 1896.

Respectfully submitted,

HENRY BRIDGE,
Superintendent of Extensions.

VALUATION OF THE WORKS.

AGGREGATES.

Real estate	\$ 418,427 29
Oil plant	14,649 29
Buildings, docks, basins, conduits, force mains at pumping works	980,384 81
Water pipe laid and in use	3,585,377 84
Meters placed and in use	91,571 58
Horses, vehicles and harnesses	7,641 50
Office furniture and fixtures	12,546 63

TOOLS AND MATERIALS ON HAND.

In Repair Department	648 75
In Meter Department	2,360 31
In Service Connection Department	1,873 85
In Iron Pipe Department	44,249 48
In Pumping Water and Works Department	25,187 02
In Hurlbut Fund Department	1,250 05
Aggregate	<u>\$5,186,167 88</u>

The above valuation consists in details as follows:

REAL ESTATE.

Office building and lot	\$ 60,000 00
Orleans street lots	33,750 00
Storage grounds and improvements	53,200 00
Pumping Works grounds and improve- ments	271,477 29
	<u>\$418,427 29</u>

OIL PLANT.

Pumping station house, engines and pipes, tank and fixtures at works	<u>\$14,649 29</u>
---	--------------------

PUMPING WORKS.

Buildings, dock, basin, conduits, pipe, etc.	\$980,384 81
Tools	1,131 77
Materials—Rope, waste, etc.	1,446 11
Materials—Gauges, valves, etc.	992 93
Materials—Iron, lead, etc.	764 58

Furniture	\$ 297 05
Wood and coal	14,375 21
Fuel oil (118,954 gals.)	2,593 20
Hoisting engines, pony pumps and boilers, electric light plant and stock, gas ma- chines, etc.....	3,586 17
Tools, materials and settees, Hurlbut Fund	1,250 05
	<hr/> \$1,006,821 88

OFFICE BUILDING.

Counter	in office.....	\$1,000 00
Fourteen office tables	" "	215 00
Six book cases	" "	660 00
Three wardrobes	" "	335 00
Ten desks	" "	262 00
Thirty-seven chairs	" "	95 00
Thirteen office stools	" "	40 00
Two city maps	" "	40 00
One marble clock	" "	100 00
One atlas map	" "	25 00
Partitions and railings	" "	900 00
Heating apparatus	" "	1,400 00
Electric light fixtures	" "	85 00
Miscellaneous properties	" "	100 00
Furniture in board room.....		575 00
Furniture in Secretary's room (excepting desk) in office.....		85 00
Two book stands	in office.....	5 00
Annunciator	" "	40 00
Engineering instruments in engin'r'g dep't		856 50
1 book of city plats	" " "	40 00
Old maps, plats and records	" "	1,500 00
New maps, plats and records	" "	3,500 00
Books and papers	" "	50 00
2 cases for drawings	" "	130 00
6 draughting tables	" "	75 00
7 stools	" "	20 00
Draughting boards, table and horses	"	30 00
Blue printing outfit	"	50 00
Roll top desk, table and 6 chairs	"	78 00
Tee squares, straight edges, etc.	"	10 00
Safe	"	50 00
Paper, vellum, ink and supplies	"	25 50
8 desks	in Supt. of Ex. room	145 00
1 table	" " " "	4 50
13 chairs	" " " "	38 00
1 copy press and stand	" " " "	10 00
8 inkwells	" " " "	6 00

1 clock	in Supt. of Ex. room	\$12 00
1 numbering stamp	" " " "	7 50
1 wash stand	" " " "	26 66
Blanks and stationery	" " " "	20 00
		<hr/>
		\$12,546 66

REPAIR DEPARTMENT.

2 sleighs	\$ 25 00
2 sets runners	20 00
3 horse blankets	17 00
2 sets calking tools.....	1 50
425 lbs. pig lead.....	14 00
870 lbs. scrap lead.....	25 00
54 lbs. sheet lead.....	2 70
1100 lbs. old brass	77 00
140 lbs. wiping solder.....	14 00
35 lbs. strap solder.....	1 75
180 lbs. 1½-in. lead pipe.....	9 40
175 lbs. 1-in. lead pipe.....	7 45
170 lbs. ¾-in. lead pipe.....	7 20
140 lbs. ½-in. lead pipe.....	5 85
8 ladles	12 00
1 plumber's fire pot.....	5 00
12 diamond-pointed chisels.....	12 00
12 flat chisels	6 00
1 anvil	2 50
2 vices	8 00
28 gate keys	33 00
14 street keys	14 00
4 pumps	75 00
12 hydrant wrenches	4 50
6 dippers	3 00
6 pairs rubber boots.....	24 00
2 leather coats	8 00
12 shovels	8 00
14 picks.....	14 00
6 pounders	6 00
20 lanterns, 18 red globes	20 00
2 saws	1 25
1 draw knife	50
1 rope ladder	1 00
1 platform scale	25 00
2 force pumps	9 00
1 grindstone	1 25
8 water pails	2 00
70 ft. ¾-in. hose.....	5 00
2 wheelbarrows	5 50
1 sledge	1 00

6 6-in. bolted sleeves	\$12 00
14 4-in. bolted sleeves.....	15 75
3 3-in. bolted sleeves.....	82
6 3-in. plain sleeves.....	3 90
2 4-in. plain sleeves.....	1 13
1 8-in. plain sleeve.....	1 76
2 3-in. bends	1 80
3 4-in. Flowers gate stems.....	5 25
6 4-in. Mich. Brass & Iron Wks stems..	10 50
4 6-in. Mich. Brass & Iron Wks stems..	9 60
4 4-in. Murdock gate stems.....	7 00
1 6-in. Murdock gate stem.....	3 00
5 4-in. stuffing boxes, M. B.....	3 75
4 6-in. stuffing boxes, M. B.....	3 20
6 8-in. stuffing boxes, M. B.....	6 00
1 4-in. stuffing box, Murdock.....	45
5 crow bars	4 50
1 machine for raising gate boxes.....	3 00
2 axes	2 00
3 4-in. caps for iron pipe.....	1 50
3 6-in. caps for iron pipe.....	1 80
2 4-in. iron plugs.....	70
2 gate boxes	4 44
1 3-in. tee	1 75
9 chains	9 00
1 5-gal. gasoline can	50
1 2-gal. gasoline cane.....	20

 \$648 75

SERVICE COCKS.

1 Smith tapping machine.....	\$850 00
2 2x4 Smith sleeve and valve.....	18 00
1 3x4 " " " "	10 00
1 4x4 " " " "	13 00
2 2x6 " " " "	23 00
1 3x6 " " " "	12 50
1 4x6 " " " "	16 00
2 2x8 " " " "	24 00
1 3x8 " " " "	14 00
1 4x8 " " " "	18 00
1 2x10 " " " "	16 00
1 3x10 " " " "	18 00
1 4x10 " " " "	22 00
3 Mueller tapping machines.....	255 00
1 30-in. saddle	1 00
2 24-in. "	2 00
2 16-in. "	2 00
2 12-in. "	2 00

3	8-in. saddle	\$3 00
3	6-in. "	3 00
3	4-in. "	3 00
3	3-in. "	3 00
5	yokes	5 00
3	pressure wrenches	1 50
3	tap handles	50
9	1-in. drills	27 00
2	¾-in. drills	5 00
8	⅝-in. drills	16 00
2	½-in. drills	3 50
425	1-in. service cocks	229 50
335	⅝-in. service cocks	103 83
5	oil cans	1 00
2	leather jackets	5 00
2	pairs rubber boots	8 00
1	Stilson wrench	75
5	monkey wrenches	3 75
1	emery wheel	2 00
2	horse blankets	5 00
8	horse blankets	24 00
8	robes	24 00
8	rubber covers	16 00
8	rubber aprons for buggies	12 00
8	tape lines	6 00
8	pipe gauges	24 00
8	street keys	12 00
8	spades	6 00
8	picks	4 00
		<hr/>
		\$1,873 83

METER DEPARTMENT.

Meters placed and in use	\$91,571 58
1 foot lathe	\$ 90 00
1 water motor	50 00
1 lathe chuck	4 00
1 drill chuck	3 00
Turning tools, small drills and tap	4 20
1 breast drill	1 75
1 lathe clamp	1 12
1 lathe plug for drill chuck	90
1 set stock and dies ¾- to 1-in.	
1 set stock and dies 1¼- to 2-in.	
1 set stock and dies 1- to 2-in. ratchet	30 00
1 2-in. pipe cutter	
1 ½-in. gas tap	30
1 ¼-in. gas tap	45
1 2-in. gas tap	2 50
1 1-in. pipe cutter	2 00

1 2-in. pipe cutter.....	\$4 00
1 3-in. pipe cutter.....	12 00
1 6-in. pipe cutter.....	15 00
10 cutter wheels	3 00
1 14-in. tramo wrench.....	3 00
1 6-in. monkey wrench.....	60
1 12-in. monkey wrench.....	1 00
2 18-in. monkey wrenches.....at \$2 50	5 00
8 combination wrenches	24 00
2 Crowfoot wrenches	2 00
2 sets of calking tools.....	1 90
1 calking hammer	3 00
3 pair pipe tongs.....at \$1 50	4 50
2 pair chain tongs.....at \$6 00	12 00
2 pipe vises	12 00
1 bench vise	3 00
1 hand vise	75
1 washer cutter	75
3 "S" wrenches	2 00
1 hollow punch	75
2 14-in. files	1 00
2 Westcott wrenches	2 50
3 small gate keys.....	3 00
1 long gate key.....	1 50
1 large gate key.....	4 00
1 nail puller	1 25
1 seal punch and lead seals.....	4 00
1 chain tackle	10 00
1 rope tackle	3 00
2 pair hip boots.....	8 00
1 hand oil can.....	35
1 one-gal. can	40
1 two-gal. can.....	60
1 five-gal. can	75
2 stop box augers.....	2 00
1 stop box shovel.....	50
4 cross cut saws.....	6 00
2 rip saws	3 00
4 hand axes	2 00
1 jack plane	50
1 wood chisel	50
1 extension bit and cutter.....	1 70
1 saw set	75
1 try square	50
2 fire pots	11 50
3 fire pots, old.....	6 00
4 small ladles	1 00
4 6-in. ladles	2 00

5 balling dippers	\$ 3 75
5 hand pumps	15 00
2 hand lanterns	60
1 testing apparatus	30 00
2 bicycles	50 00
137 bushings	7 08
107 reducers	6 45
96 unions	15 41
81 45° elbows	11 80
61 street elbows	7 46
72 elbows	7 26
27 tees	2 38
172 nipples	10 98
72 couplings	3 70
48 ft. pipe	3 36
217 meter couplings	56 35
26 solder nipples	3 85
18 check valves	15 86
9 stops	5 07
140 lbs. $\frac{3}{4}$ -in. lead pipe.....at 5 $\frac{1}{4}$ c	7 37
151 lbs. $\frac{3}{4}$ -in. lead pipe.....at 5 $\frac{1}{4}$ c	7 95
60 lbs. wiping solder	at 12c 7 20
16 lbs. $\frac{1}{2}$ and $\frac{1}{2}$ solder.....at 14c	2 24
13 $\frac{1}{2}$ lbs. tin	at 20c 2 70
10 lbs. hemp packing.....at 12c	1 20
17 lbs. rubber packing.....at 25c	4 25
42 bolts for expansion joints.....at 25c	10 50
76 lbs. 2-in. expansion joints.....at 1 $\frac{1}{2}$ c	1 14
90 lbs. 3-in. expansion joints.....at 1 $\frac{1}{2}$ c	1 48
204 lbs. 4-in. expansion joints.....at 1 $\frac{1}{2}$ c	3 96
42 lbs. 2-in. sleeves.....at 1 $\frac{1}{2}$ c	63
66 lbs. 3-in. sleeves.....at 1 $\frac{1}{2}$ c	99
31 lbs. 4-in. sleeves.....at 1 $\frac{1}{2}$ c	47
1 4-in. gate	5 00
1 dirt pounder	1 00
10 2-in. nipples	at 15c 1 50
5 3-in. nipples	at 60c 3 00
3 4-in. nipples	at 80c 2 40
2,380 lbs. old covers.....at 1 $\frac{1}{2}$ c	35 83
2,110 lbs. new brick well covers.....at 1 $\frac{1}{2}$ c	31 65
1,000 ft. hemlock lumber.....at \$11 00	12 05
240 ft. pine lumber.....at \$20 00	4 98
Meters in stock.....	1,575 00

\$2,380 31

IRON PIPE DEPARTMENT.

PIPE IN GROUND.

103 feet 45-in. pipe.....	\$	1,699	50
59,509 " 42 "		825,366	34
715 " 36 "		6,587	35
49,315 " 30 "		322,261	10
84,841 " 24 "		403,838	87
461 " 20 "		1,751	80
87 " 18 "		278	40
45,237 " 16 "		140,163	78
17,018 " 12 "		32,671	34
137,684 " 10 "		211,309	48
278,490 " 8 "		318,553	16
1,103,673 " 6 "		788,236	53
794,787 " 4 "		496,497	97
71,386 " 3 "		35,409	62
2,820 " 2 "		752	10
		<hr/>	
		\$3,585,377 34	
<hr/>			
2,646,126 total feet.			

STOCK AT RESERVOIR.

Iron pipe	\$	25,947	29
Specials		6,057	89
Gates and valves.....		1,646	41
Gate boxes		674	10
Gate well covers and cylinders.....		281	63
Lead		983	02
Packing		15	71
Oil		3	08
Coal		90	25
Scrap iron		1,936	81
Tools		5,985	09
Tile, brick and cement.....		50	00
Office fixtures		93	75
Covers and blankets		70	00
Feed, etc.		424	40
		<hr/>	
		\$44,249 43	

HORSES AND WAGONS.

1 horse, phaeton, cutter and harness— Office	\$	305	00
1 horse, vehicle and harness—Pumping Works		130	00
2 horses, 2 wagons and 2 sets of harness, 2 sets of runners, etc.—Meter.....		357	50

5 horses, 5 wagons, 1 carriage and 5 sets of harness—Repairing Leaks.....	\$750 00	
2 horses, 2 wagons, 2 sets of harness— Service Connections	400 00	
6 buggies, 2 carts and 8 sets of harness— Service Connections	720 00	
1 horse, cart and harness—Hurlbut Fund	150 00	
14 horses, 6 wagons, 6 trucks, 1 cart, 5 buggies, 17 sets of harness, 1 sleigh, 1 cutter, 2 pair runners—Iron Pipe.....	4,829 00	
		\$7,641 50
Aggregate	\$5,186,167 88	

SUPPLEMENT.

BOARD OF MANAGEMENT OF DETROIT WATER WORKS.

Board of Trustees appointed by Common Council, February 24th, 1852; organized March 1st, 1852.

Shubael Conant, Chairman. Edmund A. Brush.

Henry Ledyard. Jas. A. Van Dyke.

Wm. R. Noyes.

1853.

On the 16th of May, 1853, the Board of Water Commissioners of the City of Detroit, was organized under an act previously approved by the Common Council and passed by the Legislature, February 14th, 1853. The term of service was determined by lot, as follows:

James A. Van Dyke.....	for 3 years
Edmund A. Brush.....	for 4 years
Henry Ledyard	for 5 years
Shubael Conant	for 6 years
William R. Noyes.....	for 7 years

Shubael Conant was elected President, who, finding the duties too arduous, resigned July 30th, and Edmund A. Brush was elected.

1854.

Edmund A. Brush, President. William R. Noyes.

Shubael Conant. James A. Van Dyke.

Henry Ledyard.

1855.

Edmund A. Brush, President.	William R. Noyes.
Henry Ledyard.	James A. Van Dyke, died May
Shubael Conant.	8th.
A. D. Fraser, appointed to fill vacancy.	

1856.

Edmund A. Brush, President.	Alexander D. Fraser, re-ap-
Shubael Conant.	pointed May 1st, for 5 years.
William R. Noyes.	Henry Ledyard.

1857.

Edmund A. Brush, President,	Henry Ledyard.
re-appointed May 1st, for 5	Alexander D. Fraser.
years.	William R. Noyes.
Shubael Conant.	

1858.

Edmund A. Brush, President.	Henry Ledyard, re-appointed
Shubael Conant.	May 1st, for 5 years.
Alexander D. Fraser.	William R. Noyes.

1859.

Edmund A. Brush, President.	Julius D. Morton, appointed
Alexander D. Fraser.	for 5 years.
William R. Noyes.	Henry Ledyard, vacated by
Shubael Conant, term expired	removal from city, and
May 1st, and	John V. Ruehle, appointed
	May 1st to fill vacancy.

1860.

Edmund A. Brush, President.	William R. Noyes, re-appointed
Alexander D. Fraser.	May 1st, for 5 years.
Julius D. Morton.	John V. Ruehle.

1861.

Edmund A. Brush, President.	Jno. V. Ruehle, resigned Sept.
Alexander D. Fraser, re-appointed May 1, for 5 years.	16th, and Chauncey Hurlbut, appointed to fill vacancy.

1862.

Edmund A. Brush, President.	William R. Noyes.
re-appointed May 1st, for 5 years.	Julius D. Morton.
	Chauncey Hurlbut.
Alexander D. Fraser.	

1863.

Edmund A. Brush, President.	Chauncey Hurlbut, term expired May 1st, and
Alexander D. Fraser.	Stanley G. Wight, appointed for 5 years.
William R. Noyes.	
Julius D. Morton.	

1864.

Edmund A. Brush, President.	Julius D. Morton, term expired May 1st.
Alexander D. Fraser.	Stanley G. Wight.
William R. Noyes.	

1865.

Edmund A. Brush, President.	Stanley G. Wight.
William R. Noyes, resigned Jan. 10, and Jacob S. Far- rand, appointed to fill vacancy; term expired May 1; re-appointed for 5 years.	Julius D. Morton, re-appointed for 5 years from May 1st, 1864; died Feb. 14, 1865, and John Owen, appointed to fill vacancy.
Alexander D. Fraser.	

1866.

Edmund A. Brush, President.	Stanley G. Wight.
Alexander D. Fraser, re-appointed May 1, for 5 years.	Jacob S. Farrand.
	John Owen.

1867.

Edmund A. Brush, President.	Jacob S. Farrand.
re-appointed May 1 for 5 years.	John Owen.
Alexander D. Fraser.	Stanley G. Wight.

1868.

*Edmund A. Brush, President.	Jacob S. Farrand.
Stanley G. Wight, term expired May 1, and	John Owen.
Chauncey Hurlbut, appointed for 5 years.	Caleb Van Husan.

*Edmund A. Brush resigned January 28, and Caleb Van Husan appointed to fill vacancy, and Alexander D. Fraser elected President.

1869.

Alex. D. Fraser, President.	Jacob S. Farrand.
John Owen, re-appointed May 1, for 5 years.	Caleb Van Husan.
	Chauncey Hurlbut.

1870.

Alex. D. Fraser, President.	John Owen.
Jacob S. Farrand, re-appointed May 1, for 5 years.	Caleb Van Husan.
	Chauncey Hurlbut.

1871.

*Alex. D. Fraser, President.	Caleb Van Husan.
Jacob S. Farrand.	Chauncey Hurlbut.
	John Owen.

*Term expired May 1, and Samuel F. Hodge appointed for 5 years. Jacob S. Farrand elected President.

1872.

Jacob S. Farrand, President. *Caleb Van Husean.
John Owen. Samuel F. Hodge.
Chauncey Hurlbut.

*Term expired May 1st, and Elija Smith appointed for 5 years.

1873.

*Chauncey Hurlbut, President. Jacob S. Farrand.
John Owen. Samuel F. Hodge.
Elija Smith.

*Term expired and re-appointed. Elected President May, 1872.

1874.

Chauncey Hurlbut, President. Jacob S. Farrand.
*John Owen. Samuel F. Hodge.
Elija Smith.

*Term expired and re-appointed.

1875.

Chauncey Hurlbut, President. *Jacob S. Farrand.
John Owen. Samuel F. Hodge.
Elija Smith.

*Term expired and re-appointed.

1876.

Chauncey Hurlbut, President. Jacob S. Farrand.
John Owen. *Samuel F. Hodge.
Elija Smith.

*Term expired and re-appointed.

1877.

Chauncey Hurlbut, President. Jacob S. Farrand.
John Owen. Samuel F. Hodge.
*Michael Martz.

*Elija Smith's term expired and Michael Martz appointed to fill vacancy.

1878.

*Chauncey Hurlbut, President. Jacob S. Farrand.
John Owen. Samuel F. Hodge.

Michael Martz.

*Term expired and re-appointed.

1879.

Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. *James Beatty.

*John Pridgeon.

*John Owen's term expired and John Pridgeon appointed to fill
vacancy. Samuel F. Hodge resigned and James Beatty appointed to
fill vacancy.

1880.

Chauncey Hurlbut, President. *Jacob S. Farrand.
Michael Martz. James Beatty.

John Pridgeon.

*Term expired and re-appointed.

1881.

Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. *James Beatty.

John Pridgeon.

*Term expired and re-appointed.

1882.

Chauncey Hurlbut, President. James Beatty.
*Michael Martz. John Pridgeon.

Jacob S. Farrand.

*Term expired and re-appointed.

1883.

*Chauncey Hurlbut, President. Jacob S. Farrand.
Michael Martz. James Beatty.

John Pridgeon.

*Term expired and re-appointed.

1884.

Chauncey Hurlbut, President. Jacob S. Farrand.

Michael Martz. James Beatty.

*John Pridgeon.

*Term expired; Marshall H. Godfrey appointed.

1885.

*Jacob S. Farrand, President. Michael Martz.

Marshall H. Godfrey. *Edwin F. Conley.

*Samuel G. Caskey.

*James Beatty died and Edwin F. Conley appointed to fill vacancy.

*Chauncey Hurlbut died and Samuel G. Caskey appointed to fill vacancy.

*Jacob S. Farrand's term expired and re-appointed.

1886.

Jacob S. Farrand, President. Michael Martz.

Marshall H. Godfrey. *John Pridgeon.

Samuel G. Caskey.

*Edwin F. Conley's term expired and John Pridgeon appointed to fill vacancy.

1887.

Jacob S. Farrand, President. John Pridgeon.

Marshall H. Godfrey. Samuel G. Caskey.

*Joseph Nagel.

*Michael Martz's term expired and Joseph Nagel appointed to fill vacancy.

1888.

Jacob S. Farrand, President. John Pridgeon.

Marshall H. Godfrey. *Samuel G. Caskey.

Joseph Nagel.

*Term expired and re-appointed.

1889.

Jacob S. Farrand, President. John Pridgeon.

Samuel G. Caskey. Joseph Nagel.

*August Goebel.

*Marshall H. Godfrey resigned January 1, 1889. August Goebel appointed to fill vacancy. Term expired May 1st, and re-appointed.

1890.

John Pridgeon, President. August Goebel.
 Joseph Nagel. *Henry M. Duffield.
 Samuel G. Caskey.

*Jacob S. Farrand's term expired, and Col. Duffield was appointed to fill vacancy July 9th. 1890; John Pridgeon resigned as President of the Board, on account of ill-health, and Henry M. Duffield was elected to fill vacancy.

1891.

Henry M. Duffield, President. *John Pridgeon.
 August Goebel. Samuel G. Caskey.
 Joseph L. Hudson.

*John Pridgeon's term expired May 1st, and Frank E. Kirby was appointed for a term of 5 years.

1892.

Samuel G. Caskey, President. Henry M. Duffield.
 August Goebel. Joseph L. Hudson.
 Frank E. Kirby.

1893.

August Goebel, President. Samuel G. Caskey.
 Frank E. Kirby. Henry M. Duffield.
 Joseph L. Hudson.

1894.

Henry M. Duffield, President. Frank E. Kirby.
 Albert L. Stephens. DeWitt H. Moreland.
 Edward W. Pendleton.

1895.

Frank E. Kirby, President. Albert L. Stephens.
 DeWitt H. Moreland. Edward W. Pendleton.
 Darius D. Thorp.

CHANGES IN STREET NAMES 1896.

WHERE RUN FROM AND LOCATED BY WARD AND PRECINCT.

The following appended lists give the names of streets newly opened, and also changes in names of streets up to January 1st, 1896 :

PRESENT NAME.	FORMER NAME.	RUNS FROM	LOCATED IN	
			Ward.	Precinct.
Bancroft ave....	Williams ave. and Joy road	W. from Woodward	2-4	9-8
Barker ave.....	Ferry ave.....	E. from McClellan.	15	5
Barry st.....	Willis ave.....	E. from McClellan.	15	5
Beals ave.....	Thorburn st.....	S. from Mack.	15	3
Beaman st.....	Sherman st.....	W. from Crane.	15	4
Belvidere ave....	Company and Bolde aves.	N. from Jefferson.	15	4-5
Bingham st.....	Forest ave.....	E. from Cadillac.	15	5
Blair st.....	Palmer ave.....	E. from McClellan.	15	5
Bradley st.....	Mullett st.....	W. from Crane.	15	4
Brock st.....	Lincoln ave.....	N. from Lothrop.	6	8
Bruce st.....	Champlain st.....	W. from Crane.	15	4
Buhl st.....	Canfield ave.....	E. from Holcomb.	15	5
Burlingame ave	Englewood ave	W. from Woodward	2-4	9-8
Cadillac ave.....	Cadillac boulevard	N. from Jefferson.	15	4-5
Calumet ave.....	Brigham st.....	W. from Third.	4-6-8	6-6-7
Canton ave.	Godfrey ave.....	N. from Centerline road.	15	6
Carlton st.....	Forest ave.....	E. from McClellan.	15	5
Carver st.....	Commonwealth ave.	N. from Lothrop.	8	8
Chapin st.....	Hendrie and Medbury	E. from Fischer ave	15	5
Clay ave.....	Pallister ave.....	E. from Woodward.	1-3-5-7-9	8-8-7-6-8
Conger st.....	Piquette ave.....	E. from Baldwin.	15	6
Cook st.....	Poplar st.....	E. from Welch ave.	16	5
Crane ave.....	Laclede ave.....	N. from Mack ave.	5	5
Crary st.....	Clinton ave.....	W. from Crane ave.	15	4
Crawford Boul'd.	Hamilton ave.....	N. from Bancroft.	4-6	8-9
Cresswell st.....	Kirby ave.....	E. from McClellan.	15	5
Dallas st.....	Morton st.....	E. from Riopelle.	7	6
Deming st.....	Gilbert st.....	E. from Scotten.	14	3
Dillon ave.....	Lincoln ave.....	N. from Holden.	8	8
Douglas st.....	Warren ave.....	E. from McClellan.	15	5
Duncan st.....	Milwaukee ave.	E. from Helen.	15	5
Durand st.....	Maple st.....	E. and W. from Van Dyke.	15	4-3
Eldred st.....	Chandler st.....	W. from Junction.	16	2
Emmons st.....	Julia H. st.....	E. from McClellan.	15	5
Erekine st.....	Calhoun st.....	W. from Gratiot.	1-11	5-4
Farnsworth ave.	Farnsworth st.....	Bet. Woodward and Mt. Elliott.	1-13	7-6
Fairbanks st.....	Lafayette place.....	E. from Scotten.	16	2

PRESENT NAME.	FORMER NAME.	RUNS FROM	LOCATED IN	
			Ward.	Precinct.
Felch st.	Piquette.	E. from McClellan.	15	5
Ferry ave.	Kirby ave.	E. from Baldwin.	15	6
Finley st.	Ouster ave.	W. from Jos C'mpau	11	7
Fisher ave.	Janyne and Richard ave.	N. from Mack.	15	8
Forest ave.	Garfield ave.	E. from McClellan.	15	5
Foster st.	Beaufait ave.	N. from Centerline road.	15	6
Frederick ave.	Fredrick st.	Bet. Woodward and Mt. Elliott.	1-18	7-8
Gillet st.	Blaine and Chandler.	W. from St. Aubin.	5	7
Goodwin st.	Hastings st.	N. from Holbrook.	8-5	8-7
Gordon st.	Warren ave.	E. from Cadillac.	15	5
Goebe st.	Elm Grove ave.	W. from McClellan.	15	4
Granger st.	Palmer ave.	E. from Baldwin.	15	6
Graves st.	Hancock ave.	E. from Holcomb.	15	3
Greeley st.	Riopelle st.	N. from Reutter.	7	6
Greenwood ave.	Crawford st.	S. from Boulevard.	4-6	5-8
Grummond ave.	Cleveland ave.	W. from Woodward	2-4	9-8
Haigh ave.	Bigelow and Andrus.	W. from St. Aubin.	9	7
Hamilton boul'd.	Crawford st.	N. from Boulevard to Bancroft.	4-6	8-8
Harper ave.	Centerline rd & Buttler ave	N. City Line.	15	6
Hecla ave.	Harrison ave.	N. from Merrick.	8	8
Hendrie ave.	Boulevard.	E. from Baldwin.	15	6-5
Holcomb ave.	Ackley ave.	N. from Gratiot.	15	8
Homer st.	Agnes ave.	W. from Crane.	15	4
Houghton st.	Charles J. st.	E. from Holcomb.	15	4
Hyde st.	Harper and Trombly ayes	E. from Helen.	15	6
Kellogg st.	Baltimore ave.	E. from Baldwin.	15	6
Kirby st.	Farnsworth st.	E. from Baldwin.	15	6
Kitchell st.	Riopelle st.	N. from Pallister.	7	6
Laclede ave.	Parker ave.	W. from Concord.	15	2
Ladus st.	Trombly ave.	E. from Baldwin.	15	6
Lafayette ave.	Volunteer ave.	W. from McKinstry.	16	2
Laferty st.	Laferty place.	Howard to M.C.R.R.	8	1
Lambert st.	Piquette and Kanter ayes.	E. from Concord.	15	6
Leach st.	Croghan st.	W. from Crane.	15	4
Lernoult st.	Farnsworth st.	E. from McClellan.	15	5
Lincoln ave.	Green ave.	N. from Holden.	6	8
Longyear st.	Harper ave.	E. from Helen.	15	6
Loring st.	Orleans st.	N. from Pallister.	7	6
Mack ave.	Bellaire st.	Riopelle to Gratiot.	7-9-11-13	6-5-4
Marston ave.	Lincoln ave.	W. from St. Aubin.	9	7
Mathews st.	Macomb st.	W. from Helen.	15	2
Maxwell ave.	Morton ave.	N. from Gratiot.	15	3
Merrill st.	Seventh st.	N. from Lothrop.	6	8
Miles st.	Trombly ave.	E. from Helen.	15	6
Moffat st.	Frederick st.	E. from Holcomb.	15	3
Morley st.	Avery ave.	N. from Lothrop.	8	8
Morrell st.	Theodore st.	Bet. River and Fort streets.	16	1
Morrow st.	Dequindre st.	N. from Pallister.	7-9	6-7
Murray st.	Theodore st.	E. from McClellan.	15	5
Norvell st.	Canfield ave.	E. from Van Dyke.	15	3
Oakland ave.	Jerome ave.	N. from Piquette.	3	8
Olney st.	Whitaker ave.	E. from Russell.	7	6
Palmer ave.	Ferry ave.	E. from Baldwin.	15	6
Parker ave.	Belle Isle ave.	E. from Van Dyke.	15	4
Parkman ave.	Irving and Fourth ayes.	W. from Woodward	2-4	8-4
Phelps st.	Harper ave.	E. from Baldwin.	15	6
Philadelphia ave.	Moeller st.	E. from Russell.	7	6
Pollard st.	Horton ave.	W. from Jos C'mpau	9-11	7-7
Ransom st.	Canfield ave.	E. from Cadillac.	15	5
Rivard st.	Prospect ave.	N. from Pallister.	5	7
Robns ave.	Crane ave.	N. from Mack.	15	8
Seward ave.	Fifth ave.	W. from Woodward	2-4-6-8	9-8
Seyburn ave.	Morrise ave.	N. from Gratiot.	15	3
Sherwood ave.	Bellevue and Cleveland.	N. from Harper.	15	6
Sidney ave.	Whitaker st.	E. from Russell.	5	7
Sprague st.	Willis ave.	E. from Van Dyke.	15	3
Stanton ave.	Seventeenth st.	N. from 6d River	10	4

PRESENT NAME.	FORMER NAME.	RUNS FROM	LOCATED IN	
			Ward.	Precinct.
Sterling ave.....	Trumbull ave.....	N. from Holden.	8	8
Stevens st.....	Superior st.....	E. from Van Dyke.	15	5
Stuart st.....	Superior st.....	E. and W. from Concord.	15	6
Sylvan st.....	Gladstone st.....	E. from Vinewood.	14	5
Sylvester st.....	Alexandrine and De Vogelaer.....	E. from Van Dyke.	15	5
Taylor ave.....	Raymond ave.....	W. from Woodward	2-4-6-8	9-8
Thirteenth st.....	Laferty st.....	S. from Howard.	8	1
Tonti ave.....	Parker st.....	E. and W. from Van Dyke.	15	3-4
Walbridge st.....	Sargent st.....	E. from Baldwin.	15	6
Warren ave.....	Plymouth road.....	W. from 34th.	12-14	6-5
Webb ave.....	Wilkins ave.....	W. from Woodward	4	8
Wellington ave.....	Reutter st.....	E. from Russell.	7	6
Whipple st.....	Frederick.....	E. from Baldwin.	15	6
Wilbur st.....	Endicott ave.....	E. from Lincoln.	6	8
Willard st.....	Hancock ave.....	E. from Van Dyke.	15	5
Wisner st.....	Harper.....	E. from Cadillac.	15	5

STREETS NEWLY OPENED.

LOCATED BY WARDS AND PRECINCTS, JANUARY 1896.

	WARD.	PRECINCT.
Adel St.—N. from Harper.	9-11	7
Adele St.—St. Aubin to Chene	9-11	7
Amsterdam St.—Case to Third	2-4	6
Annetta Ave.—N. from Caniff to N. City Line	2	8
Antoinette St.—Woodward to Third	2-4	6
Beach Place—from the River to Edgemere Boulevard	15	1
Beck St.—from Parkman to N. of Seward	4	6
Beneteau St.—N. from Jefferson E. of City Limits		
Berlin St.—from Elmwood to Boulevard	13-15	2-4
Bohemian Ave.—Case to Third	2-4	6
Brock Place—S. from Pallister	6	6
Brown Place—W. from Twenty-Sixth	14	5
Burrell Place—E. from Maybury Ave.	12	6
Cameron Ave.—N. from Holbrook to City Line	5	7
Campau St.—Dix to Toledo	14	2
Canfield Ave.—Lincoln to Grand River	8	7
Canton Ave.—N. from Harper	15	6
Carter Place—E. from Twelfth	6-6	6
Carrie St.—N. from Harper	15	6
Chippewa Ave.—Gratiot to Harper	15	6
Church St.—E. and W. of Eleventh	8	2
Colburn Ave.—Case to Third	2-4	6
Concord Ave.—N. from Harper	15	6
Dexter St.—N. from N. Boulevard	12	6
Duncan St.—Morton to Newland	15	6
Dyar Ave.—N. from Holbrook	7	6
Eastern Place—W. from Twenty-Sixth	14	5
Edgemere Boulevard—E. and W. from Beach Place	15	4
Elm St.—between Twelfth and Thirteenth	8	4-5
Ferry Ave.—Woodward to Third	2-4	7
Finley Ave.—W. from Jos. Campau	9-11	7
Fordyce Ave.—N. from Marston Ave.	9-11	7
Foster St.—N. from Harper	15	6
Frank St.—Sixth to Seventh	4	6
G. A. R. St.—Welch to Hammond	16	5
Greenfield Ave.—S. from Pallister	6	6
Grousel St.—Otis to Michigan Ave	16	4
Gilbert Place—Twelfth to Hamilton Boulevard	6-6	6
Goodwin St.—N. from Holbrook to City Line	2-5	6-7
Hazel St.—between Harrison and Grand River	8	6
Helen Ave.—Macomb to Mack	15	2
Holden Ave.—Case to Third	2-4	6
Iroquois St.—N. from Jefferson	15	4
Island View Boulevard—S. from Jefferson	15	1
Ironside St.—Welch to Hammond	16	5
J. P. Ave.—Clark to Scotton	14	1
Knox St.—from Holbrook to Gilette	7	6
Lambert St.—Morton to Newland	15	5
Lamson Place—S. from Pallister	6	6
Lee Place—E. from Twelfth	8	6
Le May St.—N. from Jefferson E. of City Limits		
Lyman St.—W. from Chene	9-11	7

	WARD.	PRECINCT.
Lodi St.—N. of Holburn Ave.....	13	5
Mansur St.—Harper to Piquette.....	5	7
Marshland Road—N. from Jefferson, E. of City Limits.....		
Maxwell St.—N. from Jefferson.....	15	4
Merrill Place—S. from Pallister.....	6	8
McBrearty Place—Rivard to Russell.....	5	7
Medbury Ave.—Morton to Newland.....	15	5
Montclair St.—N. from N. Boulevard (bet. 18th and Grand River).....	12	6
Montrose St.—W. from Hamilton Boulevard.....	6-8	8-8
Morrow St.—N. from Clay and Hobrook.....	9	7
Moore Place—W. from Twenty-Sixth.....	12	6
Morton Ave.—Gratlot to Harper.....	15	5
Nelson St.—between D. G. H. & M. R. R. and Dyar.....	7	6
Newland St.—Mack to Harper.....	15	5
Newport Ave.—N. of Jefferson, E. of City Limits.....		
Newton Ave.—W. from Jos. Campau.....	9-11	7
O'Flynn St.—N. of Jefferson, E. of City Limits.....		
Otto St.—N. and S. from Seward.....	4	8
Park View Boulevard—S. from Jefferson.....	15	4
Parker St.—N. from Jefferson.....	15	4
Pollard Ave.—W. from Jos. Campau.....	9-11	7
Richard St.—Seyburn to Van Dyke.....	15	3
Rolf Place—N. from Mack.....	15	5
Saginaw St.—N. from Holburn Ave.....	13	5
Scovel Place—W. from Twenty-Sixth.....	12	6
Seneca St.—Gratlot to Harper.....	15	5
Seminole St.—N. from Jefferson.....	15	4
Sherwood St.—N. from Harper.....	15	6
Sixth St.—Lysander to Forest.....	6	6
Spring St.—Clark to Scotten.....	14	1
Stevens Ave.—Gratlot to Harper.....	15	5
Stephens St.—Mack to Harper.....	15	5
St. Charles St.—Harper to Strong.....	15	6
St. Albertus Place—Dequindre to St. Aubin.....	9	6
St. Jean Road—N. from Jefferson, E. of City Limits.....		
Sylvester St.—E. and W. from Van Dyke.....	15	6-5
Third Ave.—N. Boulevard to N. of Bethune.....	4	8
Thurman St.—Gratlot to Hendrie.....	15	5
Toledo St.—between Twenty-Fourth and Scotten.....	12-14	2-3
Twenty-Sixth St.—S. from Grand River.....	12	6
Vienna St.—Woodward to Third.....	2-4	8
Warsaw Place—E. from Dequindre.....	9	6
Welsch Ave.—Ranspach to Michigan.....	16	4
Wilbur Ave.—E. from Lincoln.....	6	8
Wildemere St.—Welsch to Hammond.....	12	6

PIPE CONSTRUCTION, 1895.

The following is a detail list of the total lines laid, giving locations, size of pipe and length of same:

DATE.	LOCATION.	3	4	6	8	10	12	34	43	DISTRICT IN INCHES.
August 7.	Adelle st., 25 ft. w. of e. of Cheese to 3 ft. w. of w. of same.	56								
August 1.	Agnes ave., 31 ft. w. of e. of Semple to 30 ft. w. of e. of Ingham.				443					
August 1.	Alfred st., 16 ft. w. of e. of Woodward to 16 ft. w. of e. of John R.				783					
November 8.	Alfred st., 16 ft. w. of e. of John R. to 8 ft. w. of w. of Brush.				604					
July 21.	Alger ave., 56 ft. w. of e. of John R. to 106 ft. e. of e. of same.				225					
September 19.	Arden st., crossing Jos. Campau.				67					
July 25.	Baldwin st., 20 ft. w. of Mack to 209 ft. s. of same.				309					
November 14.	Baldwin st., n. line of Champlain to 4 ft. s. of n. of alley s. of Monroe.				115					
June 7.	Bellvue ave., 25 ft. s. of e. of Frederick to 10 ft. n. of n. of same.				184					
June 14.	Belding ave., 4 ft. e. of e. of Mack to 177 ft. s. of same.				178					
September 20.	Belding ave., 17 ft. n. of e. of Karchow to 65 ft. s. of Lorrain.				399					
June 8.	Besse st., 11 ft. e. of e. of Collins to 120 ft. w. of w. of Moran.				80					
July 21.	Brown pl., 25 ft. e. of e. of McLaughlin Boulevard to 86 ft. e. of e. of same.				171					
July 21.	Burlingame ave., 35 ft. w. of e. of Woodward to 146 ft. e. of e. of same.				1,350					
May 3.	Burns ave., 51 ft. s. of n. of Jefferson to 360 ft. n. of same.				359					
June 30.	Burns ave., 51 ft. s. of n. of Jefferson to 360 ft. n. of same.				80					
May 3.	Burns ave., 51 ft. s. of n. of Jefferson to 360 ft. n. of same.				80					
June 30.	Burns ave., 51 ft. s. of n. of Jefferson to 360 ft. n. of same.				1,417					
August 12.	Cadillac pl., 30 ft. w. of e. of Maybury to 213 ft. s. of Sullivan.				724					
May 4.	Cadillac pl., 253 ft. w. of Bates to 133 ft. e. of same.				453					
October 3.	Cameron ave., 25 ft. s. of n. to 20 ft. n. of n. of Haligh.				128					
September 19.	Catherine st., crossing Jos. Campau.				18					
June 19.	Cavalry ave., 30 ft. s. of n. of Fort to 15 ft. s. of n. of Colburn.				432					
November 8.	Champlain st., 17 ft. w. of e. of Cavalry to 321 ft. e. of same.				344					
May 15.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				477					
September 19.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				11,364					
September 19.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				318					
September 19.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				70					
September 19.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				311					
February 9.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				305					
June 15.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				301					
May 15.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				321					
December 14.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				301					
December 14.	Champlain st., 25 ft. w. of e. of River st. to 430 ft. s. of same.				1,167					

May 8.....	Eighth st., 13 ft. n. of n. of Abbott to 80 ft. n. of s. of Michigan.	1,586	47		
September 36.....	" crossing s. side of Michigan.		813		
May 16.....	" n. line of Michigan to 3 ft. n. of Orchard.			178	
June 2.....	Eighteenth-and-a-half st., 504 ft. s. of River to 877 ft. s. of same			180	
December 17 '94.....	677 ft. s. of River to 857 ft. s. of same		988		1,239
September 27.....	Fort st., 30 ft. w. of s. of Pulford to 25 ft. n. of s. of Zander.				
November 28.....	" alley s. of 16 ft. w. of s. of Tenth to 21 ft. w. of e. of Seventh				
January 15.....	Frederick st., 30 ft. w. of e. of Bellevue to 32 ft. e. of w. of Concord.		376		109
" 12.....	Frontenac Boulevard, 42-inch Main to 8 ft. n. of Champlain.				54
" 12.....	" 8 ft. s. of n. of St. Paul to s. line of Waterloo, (e. side).	1,533	2,719		
Feb. and April 23.....	" s. line of Waterloo to 22 ft. s. of n. of Mack, (e. side).		780		
June 17.....	" n. line of Gratiot to 11 ft. n. of n. of Farnsworth w.		1,074		
December 18.....	" 4 ft. s. of n. of Farnsworth to 13 ft. n. of s. of Ferry, (w. side)		769		
June 27.....	" 7 ft. n. of s. of Ferry to 13 ft. n. of s. of Hendrie, (w. side)				3,451
April 29.....	" n. line of Mack to Gratiot, (e. side).				43
October 8.....	" 23 ft. n. of s. of Mack to n. line of same		540		
November 26.....	Gillet st., 18 ft. s. of n. of Alger to 10 ft. s. of n. of Gillet.		386		
May 28.....	" Gillet st., 10 ft. s. of w. of Gratiot to 238 ft. e. of same		510		
October 14.....	Hugh ave., 153 ft. e. of Woodward to 663 ft. e. of same		656		
May 27.....	" 22 ft. w. of e. of Russell to 20 ft. s. of e. of Cameron.		941		
June 13.....	Hamilton ave., 689 ft. n. of n. of Canfield to 3 ft. s. of e. of Warren.		183		
October 8.....	Harper ave., 29 ft. w. of s. of Thirteenth to 134 ft. e. of same.		973		
February 2.....	Hastings st., 136 ft. s. of s. of Palmer to s. line of Medbury.		824		
August 1.....	" Hazel st., 35 ft. w. of e. of Harrison to 35 ft. w. of e. of National.		55		
June 10.....	Hendrie ave., crossing Hastings.		556		
September 19.....	" 24 ft. w. of e. of Van Dyke to w. line of Maxwell.		413		
May 15.....	" alley s. of 378 ft. w. of Rivard to 16 ft. w. of e. of same.		431		
June 10 and Aug. 10.....	Hendrie Boulevard, e. line of Collins to 32 ft. w. of e. of McDougall Boulevard.				1,970
January 1.....	" 30 ft. w. of e. of Mt. Elliott to 13 ft. w. of e. of Collins				
February 29.....	" 13 ft. e. of w. of Frontenac to 30 ft. w. of e. of Mt. Elliott.		2,545		
September 19.....	High st., 1 ft. e. of e. of Beaumont to 3 ft. w. of e. of St. Antoine.		433		
May 11.....	Hubbard Boulevard, s. line of McDougall to 10 ft. n. of s. of Scofield.	1,960	388		
August 5.....	Hudson ave., 18 ft. w. of e. of Fourteenth to 36 ft. e. of w. of Wabash		329		
June 7.....	Russar st., 25 ft. w. of e. of Military to 294 ft. e. of same.		45		702
June 10.....	Illinois st., 3 ft. w. of w. of Collins to 4 ft. e. of same.		712		
June 10.....	Iroquois ave., 5 ft. s. of Champlain to 21 ft. n. of n. of Agnes.				
June 10.....	" 21 ft. s. of n. of Agnes to 2 ft. n. of n. of St. Paul.	180	70		
September 19.....	" alley e. of 5 ft. n. of s. of alley n. of Jefferson to 115 ft. n. of same.				
June 10 and Aug. 10.....	Jay st., crossing Jos. Campan.				
January 17.....	Jefferson ave., 19 ft. e. of w. of Grape to Pumping Works grounds.				3,863
September 19.....	" alley n. of 15 ft. v. of e. of Parker to 5 ft. w. of e. of alley e. of				
May 23.....	Iroquois.	1,294	1,906		
May 20.....	Josephine ave., e. line of Woodward to 1,905 ft. e. of same.		1,400		
June 16.....	Jos. Campan ave., 25 ft. n. of s. of Catherine to 20 ft. n. of s. of Jay.		916		
September 19.....	Kercheval ave., 24 ft. e. of w. of Mt. Elliott to 27 ft. e. of e. of Beaufait.		2,944		
May 20.....	" King ave., 3 ft. e. of e. of Woodward to 871 ft. e. of e. of Brush.		796		
June 16.....	" Kirby ave., 34 ft. w. of e. of Maybury to 319 ft. e. of Sullivan.				

PIPE CONSTRUCTION, 1895.—CONTINUED.

[illegible]

May 6.....	North Boulevard, 3 ft. w. of e. of Cass to 13 ft. e. of e. of same, (s. side).....	18	
April 23.....	" " 27 ft. w. of w. of Chene to w. line of same.....	97	
May 7.....	" " 30 ft. e. of w. of Dubois n. (n. side).....	174	
April 23.....	Park ave, 514 ft. n. of n. of (landed) to 134 ft. n. of n. of Warren.....	1,300	2,081
May 15.....	Park st., 17 ft. n. of s. of Columbia to 20 ft. n. of s. of Baggs.....	813	44
July 8.....	Park View ave., s. line of Jefferson to 12-10 main.....	978	
May 27.....	Furker ave., 6 ft. n. of s. of alley n. of Jefferson to 11 ft. n. of s. of Fordi.....	58	
September 14.....	Palmer ave., crossing Hastings.....	110	
July 10.....	Pennsylvania ave., 70 ft. s. of s. of Kercheval to 410 ft. n. of n. of same.....	600	
January 2.....	" " w. of e. of Cheve to 410 ft. s. of e. of same.....	450	
October 10.....	" " w. of e. of Fifteenth to w. line of alley.....	154	
June 21.....	" " w. of Humboldt to 22 ft. e. of w. of e. of same.....	320	
May 27.....	" " w. of e. of Twentieth to 30 ft. w. of e. of Twentieth.....	897	1,960
Dec. to Jan. 25.....	" " 31 ft. w. of e. of Fourteenth to 9 ft. w. of w. of Tenth.....		
May 17.....	" " alley s. of 8 ft. w. of e. of Twentieth to 28 ft. e. of e. of same.....	31	
September 34.....	Putnam ave., 5 ft. e. of w. of alley e. of Second to w. line of Cass (s. side).....	495	
November 4.....	" " 34 ft. e. of w. of Cass to 318 ft. w. of same.....	380	
June 11.....	Rivard st., 33 ft. n. of s. of Harper to 136 ft. n. of n. of same.....	172	
August 15.....	Elver Road, 55 ft. w. of w. of Dearborn to 49 ft. w. of Exposition ave.....	2,346	
May 23 and June 23.....	" " 22 ft. e. of w. of Pleasant ave. to 74 ft. e. of e. of Swain.....	410	
November 23.....	Rolf Place, 22 ft. s. of n. of Mack to 321 ft. n. of n. of same.....	543	
August 10.....	Romeyn st., 41 ft. w. of e. of Wesson to 236 ft. e. of e. of same.....	377	
May 16 and June.....	Second ave., 16 ft. w. of e. of Campbell to 23 ft. e. of w. of Cavalry.....	559	
June 1.....	Seuimole ave., 16 ft. w. of e. of Putnam to 28 ft. n. of s. of Merrick.....	399	
July 2.....	" " alley e. of 28 ft. n. of s. of Warren to 16 ft. n. of s. of Putnam.....	417	
September 17.....	" " alley e. of 6 ft. n. of s. of alley n. of Jefferson to n. line of Champlain.....	378	
Feb. to March 13.....	" " alley e. of n. line of Champlain to 21 ft. s. of n. of Agnes.....	684	712
September 23.....	Sherman pl., 25 ft. w. of e. of Twenty-sixth to 296 feet e. of e. of same.....	228	
August 7.....	St. Aubin ave., 15 ft. e. of w. of Jus. Camysau to 2 ft. e. of e. of same.....	57	
September 28.....	St. Clair ave., 41 ft. s. of s. of N. Boulevard to 27 ft. n. of s. of Clay ave.....	645	1,387
June 5.....	St. Joseph st., w. line to 184 ft. e. of e. of Collins.....		
September 26.....	Stanley ave., 30 ft. w. of e. of Iroquois to 26 ft. w. of e. of Burro.....	236	
May 17.....	State st., 25 ft. w. of e. of Humboldt to 2 ft. e. of s. of Eighteenth.....	819	
September 28.....	Strophens ave., 26 ft. n. of s. of Grubert to 396 ft. n. of n. of same.....	422	138
July 12.....	Sullivan ave., 12 ft. n. of n. of Buchanan to 484 ft. n. of n. of same.....	451	
May 16.....	Taylor ave., 2 ft. w. of e. of Hamilton to w. line of Woodward.....	2,000	
December 3.....	Thirtieth st., 5 ft. s. of e. of alley s. of Porter 18 ft. n. of s. of Porter.....	110	
June 6.....	Tondt st., 34 ft. w. of e. of Harper to 210 ft. n. of n. of same.....	343	
April 23.....	Trumbull ave., 21 ft. s. of e. of Parker 15 ft. w. of e. of Marshall.....	312	
January 10.....	" " 24 ft. s. of n. of Fort to 9 ft. n. of s. of alley s. of Abbott.....	887	
	" " 24 ft. s. of n. of Abbott to 30 ft. n. of s. of Michigan.....	1,917	
	Twelfth st., crossing Porter.....	60	

PIPE CONSTRUCTION, 1874, 1875, 1876, 1877.

DATE.	LOCATION.	HYDRANTS IN 1874									
		0	5	10	15	20	25	30	35	40	
June 21	Twenty-first st. s. to n. line of Porter.										54
July 28	Twenty-sixth st. 38 ft. s. of w. of Hudson to 38 ft. s. of Grand River.										1,444
August 12	Twenty-sixth st. 64 ft. s. of s. of Hudson to 125 ft. s. of same.										41
April 19	Warren ave. 30 ft. s. of w. of Fourteenth to 7 ft. s. of s. of alley e. of										318
June 11	line of Mt. Elliott to 178 ft. s. of s. of same.										178
July 21	17 ft. s. of w. of Bedford st. to 63 ft. s. of same.										63
July 28	Waterloo, crossing w. side of Mt. Elliott.										16
May 17	Wardward ave., alley w. of 5 ft. s. of n. of alley s. of State to 26 ft. n. of s. of Clifford.										1,082
September 16	crossing n. s. of Clifford.										25
October 19	alley w. of Congress to 3 ft. s. of s. of alley s. of Fort.										310
June 6	alley w. of 8 ft. n. of s. of alley s. of Larned to 31 ft. s. of n. of Larned.										130
June 6	Willis ave., 162 ft. s. of e. of Collins to w. line of Moran.										518

To this report I again append the number of hydrants and reservoirs added to the pipeage. The following is as reported by Mr. James F. Tryon, Secretary of the Fire Department:

Hydrants 116, reservoirs 21, making the total number now in use, 2,594 hydrants and 541 reservoirs.

PIPEAGE OF THE CITY OF DETROIT,

JANUARY, 1896.

ALPHABETED BY STREETS, SHOWING THE SIZE OF IRON
PIPE IN USE.

LOCATION.	DIAM. INCHES.
A st., e. from Scotten 78 ft.....	4
" Hubbard to Vinewood.....	4
Aberle ave., e. from Russell 349 ft.....	4
Abbott st., Tenth to Cass	24
" w. from Third 20 ft.....	6
" alley s. of, crossing Sixth.....	6
" alley s. of, 196 ft. e. of e. of Twelfth to Cass.....	4
Adair st., the river to 10 ft. n. of s. of Jefferson.....	6
" 10 ft. n. of s. to 29 ft. n. of s. of Jefferson.....	4
Adams ave., John R. to Randolph.....	6
" Witherell to Hastings.....	4
" alley s. of Cass to 240 ft. e. of Clifford.....	4
" alley s. of, John R. to Randolph.....	4
Adelaide st., 30 ft. e. of w. of Woodward to 22 ft. e. of w. of Brush... 8	
" 22 ft. e. of w. of Brush to 24 ft. e. of w. of Beaubien.....	10
" 24 ft. e. of w. of Beaubien to Orleans.....	4
" Orleans to 11 ft. e. of e. of same.....	18
" 11 ft. e. of e. of Orleans to Gratiot.....	10
" crossing Gratiot	8
Adele st., 23 ft. w. of e. of Chene to 8 ft. w. of w.....	6
Agnes ave., E. Boulevard to Field.....	4
" Baldwin to Seyburn.....	6
" 21 ft. w. of e. of Seminole to 20 ft. w. of e. of Iroquois.... 8	
Albert st., Hammond to Wesson.....	6
Alexandrine ave., Grand River ave. main, to alley w. of Common- wealth	6
" alley w. of Commonwealth to alley w. of Trumbull	4
" alley w. of Trumbull to Seventh.....	6
" Seventh to Sixth.....	4
" Greenwood to 150 ft. w. of Fourth.....	4
" 150 ft. w. of Fourth to Fourth.....	3
" Third to Cass.....	4
" Cass to Woodward.....	6
" Woodward to John R.....	4
" John R. to 143 ft. w. of w. of Brush (center of st.)	6
" 143 ft. w. of, to Brush (center of street).....	4
" 143 ft. w. of, to 34 ft. e. of e. of Brush (south lawn)	6
" 34 ft. e. of e. of Brush to Beaubien.....	4
" Beaubien to 15 ft. w. of w. of St. Antoine.....	3

LOCATION.		DIAM. INCHES.
Alexandrine ave., 15 ft. w. of w. of St. Antoine to 20 ft. w. of e. of		
same		4
20 ft. w. of e. of St. Antoine to Russell.....		6
Russell to alley w. of Dubois.....		4
alley w. of Dubois to Chene, w. line.....		2
w. line of Chene to w. line of Grandy.....		4
crossing Grandy		2
McDougall to alley e. of.....		6
alley e. of McDougall to 367 ft. e. of e. of Moran....		4
Alfred st., from 30 ft. e. of w. of Woodward 16 ft. w. of e. of John R..		2
from 16 ft. w. of e. of John R. to e. line of Brush.....		6
from e. line of Brush to Russell.....		4
Russell to Orleans		2
Orleans to Dubois		4
Alger ave., 16 in. main to e. line of Woodward.....		6
e. from Woodward 514 ft.....		4
from 514 ft. e. of Woodward to 106 ft. e. of e. of John R.....		6
Russell to 443 ft. e. of Greeley.....		6
Amherst st., 23 ft. e. of w. of Cavalry to 314 ft. w. of Junction.....		6
314 ft. w. of w. to Junction.....		4
Amsterdam st., 44 ft. w. of e. of Second to 44 ft. w. of w. of Cass.....		6
44 ft. w. of w. to e. line of Cass.....		4
e. line of Cass to w. line of Woodward.....		6
crossing Woodward, west side.....		4
Annexation st., Junction to 540 ft. e. of e. of same.....		4
Anthon st., 280 ft. w. of Campbell to 360 ft. w. of Junction.....		6
360 ft. w. of w. to 30 ft. w. of e. of Junction.....		4
Antietam st., Rivard to 22 ft. w. of w. of McDougall.....		4
crossing Jos. Campau.....		6
Antoinette st., crossing Eighteenth, east side.....		4
e. line of Eighteenth to 28 ft. e. of w. of Stanton.....		6
Fifteenth to 223 ft. w. of Fourteenth.....		6
223 ft. w. of, to Fourteenth.....		4
Fourteenth 128 ft. w. of Wabash.....		6
138 ft. w. of, to Wabash.....		4
193 ft. w. of, to Twelfth.....		4
43 ft. w. of e. to e. line of Second.....		4
e. line of Second to Cass.....		6
Arlington pl., Cass to Woodward.....		4
Arndt st., Gratiot to 6 ft. w. of w. of Elmwood.....		6
6 ft. w. of w. of Elmwood to Mt. Elliott.....		4
Artillery ave., n. from River st. to Battery.....		6
crossing Fort		6
78 ft. s. of s. to n. line of Lafayette.....		6
477 ft. s. of s. of main in Dix.....		2
Ash st., Vinewood to Twenty-seventh.....		4
Twenty-fourth to e. line of Tillman.....		4
Maybury to 250 ft. e. of e.....		4
250 ft. e. of e. of Maybury to Sullivan.....		2
Sullivan to Humboldt		4
Humboldt to 166 ft. e. of e. of same.....		2
166 ft. e. of e. of Humboldt to e. line of Eighteenth.....		4
e. line of Eighteenth st. to Seventeenth, w. line.....		2
w. line of Seventeenth to e. line of Sixteenth.....		4
crossing Fifteenth		4
148 ft. w. of w. to Wabash.....		4
alley e. of Wabash to Twelfth.....		6

LOCATION.	DIAM. INCHES.
Ash st., Twelfth to Harrison.....	4
" National to alley w. of Trumbull.....	6
" alley e. of Trumbull to Grand River.....	4
Atkinson ave., 16 in. main to 21 ft. w. of Woodward.....	6
Atwater st., Shelby to 8 ft. w. of w. of Brush.....	6
" 8 ft. w. of w. of Brush to 149 ft. e. of e. of Rivard.....	4
" 149 ft. e. of Rivard to 33 ft. w. of e. of McDougall.....	6
" alley s. of, alley w. of Bates to Randolph.....	4
Audrain st. (in line of), Clippert to Michigan Brass & Iron Works, 1,806 ft. (outside of city limits)	4
Aurelia st., w. line of Thirteenth to Twelfth.....	4
Avery ave., 21 ft. n. of s. of Willis to 345 ft. n. of Kirby.....	6
" s. from Piquette 104 ft.....	6
" alley w. of, Alexandrine to alley s. of Willis.....	4
" alley w. of, Lysander to Lombard terrace.....	6
B st., 313 ft. w. of, to Vinewood.....	4
Bagg st., Fifteenth to Woodward	24
" crossing Greenwood on e. side.....	4
" e. line of Greenwood to Fifth	3
Bagley ave., Grand River to Park.....	8
" alley e. of, Cass to alley s. of Park.....	4
Baker st., Scotten to Hubbard.....	4
" crossing e. side of Vinewood.....	6
" Vinewood to Twenty-fifth.....	4
" crossing Twenty-fifth, e. side.....	6
" Twenty-fifth to Twenty-fourth.....	4
" Twenty-fourth to Seventh.....	8
" Eighth to Seventh.....	4
" alley s. of, Fourteenth to Wabash.....	4
" alley s. of, Tenth to Eighth.....	3
" alley s. of, Eighth to alley w. of Fourth.....	4
Baldwin ave., Jefferson to Waterloo.....	6
" from Mack s. 267 ft.....	6
" Mack to Gratiot.....	10
" Gratiot to Harper.....	8
Baltimore ave., w. from Sullivan 297 ft.....	4
" from Lincoln to w. line of Greenwood.....	6
" Greenwood to Woodward.....	4
" Woodward to w. line of Brush.....	3
" crossing Brush w. side 41 ft.....	6
" alley s. of, Greenwood to Forsyth.....	6
Bancroft ave., 16 in. main, to w. line of Woodward.....	6
Bates st., Atwater to Farmer.....	6
" from Congress to Champlain.....	30
" alley e. of, n. line of Atwater to alley s. of Woodbridge....	3
Battery st., Artillery to Dragoon.....	6
Beacon st., crossing Brush, e. side.....	6
" Brush to 211 ft. e. of St. Antoine.....	4
Beals ave., s. from Mack 1,628 ft.....	6
Beaman st., Crane to alley w. of.....	4
Beaubien st., from Atwater to Champlain, s. line.....	6
" s. line Champlain to 4 ft. s. of n. of alley n. of.....	8
" alley n. of Champlain to Clinton.....	6
" Clinton to s. line of Gratiot.....	4
" crossing Gratiot, s. side.....	6
" Gratiot to 14 ft. s. of n. line Madison.....	8
" Madison to 23 ft. s. of n. line of Elizabeth.....	4

LOCATION.		DIAM. INCHES.
Beaubien st. 21 ft. s. of n. line of Elizabeth to 23 ft. n. of a. line of Columbia	12	
23 ft. n. of a. of Columbia to 16 ft. n. of s. of Adelaide....	10	
crossing Adelaide, n. side.....	6	
n. line Adelaide to Watson.....	4	
Watson to Harper.....	10	
Harper to s. line of Boulevard.....	6	
crossing Boulevard, s. side.....	10	
47 ft. s. of n. of Boulevard to Custer.....	6	
Beaubien ave., s. from Jefferson 535 ft.	6	
535 ft. n. of Jefferson to 225 ft. s. of Champlain.....	4	
535 ft. s. of Champlain to 263 ft. n. of Kercheval.....	6	
s. line of Mack to 190 ft. n. of n. of Forest.....	6	
crossing N. Boulevard	6	
Bever st., Vinewood to Twenty-seventh.....	4	
Beech st., Seventh to First.....	4	
Beaumont ave., Jefferson to 231 ft. n. of n. of Stuart.....	6	
crossing Gratiot	6	
Gratiot to 25 ft. s. of s. of Frederick.....	4	
25 ft. s. of s. of Frederick 100 ft. n. of n. of same.....	6	
crossing N. Boulevard.....	8	
Belmont ave., 16-in. main to e. line Woodward.....	6	
30 ft. w. of w. of to Oakland.....	6	
Belvidere ave., crossing Jefferson, n. side.....	10	
n. from Jefferson to 235 ft. n. of n. line.....	6	
30 ft. s. of n. of St. Paul to 535 ft. n. of Lorman.....	6	
crossing s. side of Mack to 177 ft. s. of same.....	6	
Benton st., Brush to 8 ft. w. of e. line of Beaubien.....	8	
from Beaubien to Russell.....	4	
Berlin st., Gratiot to Jos. Campau ave.....	8	
crossing Jos. Campau ave.....	4	
Jos. Campau to alley w. of McDougall.....	6	
alley e. of McDougall to Elmwood.....	8	
crossing Elmwood	4	
Ellery to Mt. Elliott	4	
Bethune ave., Hamilton Boulevard to Woodward.....	6	
Biddle st., Vinewood to Twenty-seventh.....	4	
Blaire ave., 16-in. main to w. line Woodward.....	8	
w. from Woodward 1,616 ft.....	4	
Bloome st., E. Boulevard 81 ft. e. of e. of same.....	6	
214 ft. w. of Collins to w. line of same.....	4	
11 ft. e. of e. of Collins to 234 ft. w. of w. of Moran.....	6	
234 ft. w. of, to Moran.....	4	
Boulevard, between Fort and Myrtle, see W. Boulevard.		
" Twenty-seventh and Hubbard, see Myrtle Boulevard.		
" Myrtle and N. Boulevard, see Hubbard Boulevard.		
" Hubbard Boulevard and McDougall, see N. Boulevard.		
" N. Boulevard and Hendrie, see McDougall Boulevard.		
" McDougall and Frontenac, see Hendrie Boulevard.		
" Hendrie and Jefferson, see Frontenac Boulevard.		
Bowen ave., Jefferson to 50 ft. s. of Chapoton.....	6	
Bradley st., w. from Crane 211 ft.....	4	
Brady st., Woodward to 3 ft. w. of w. of Brush.....	8	
3 ft. w. of w. to 18 ft. w. of e. of Beaubien.....	8	
Beaubien to Russell	4	

	DIAM. INCHES.
Brainard st., Trumbull to e. line of Seventh.....	6
" e. line of Seventh to Sixth.....	4
" Greenwood to alley w. of Fourth.....	3
" alley w. of, to 16 ft. w. of e. of Fourth.....	4
" 16 ft. w. of e. of Fourth to 17 ft. e. of w. of Third.....	6
" Third to Cass.....	4
Brandon pl., 114 ft. w. of w. of to Moran.....	6
Brandon ave. (west), Campbell to Junction.....	6
" Junction to Hubbard.....	4
Bratshaw st., 15 ft. w. of e. of Fourth to 28 ft. e. of w. of Third.....	10
Breckenridge st., w. from Humboldt 74 ft.....	4
" Humboldt to Eighteenth.....	6
" Eighteenth to 148 ft. w. of Sixteenth.....	4
" 148 ft. w. of Sixteenth to Sixteenth.....	6
" Fifteenth to 140 ft. w. of Fourteenth.....	6
" 140 ft. w. of, to Fourteenth.....	4
Brevoort pl., Twenty-second to alley e. of.....	6
" Nineteenth to alley w. of Eighteenth.....	4
Brewster st., crossing e. side of Brush.....	6
" e. line of Brush to Russell.....	4
" Riopelle to Gratiot.....	4
Brinket st., Crane to Hibbard.....	6
Bristol pl., Twenty-second to Twenty-first.....	4
Brown pl., 26 ft. w. of e. of Twenty-sixth, e. 146 ft.....	6
Bruce st., 2 ft. w. of alley w. of, to Crane.....	4
Brush st., Atwater to Jefferson.....	6
" crossing Jefferson.....	8
" Jefferson to Congress.....	4
" Congress to Gratiot.....	8
" Gratiot to 28 ft. n. of s. of Madison.....	4
" Madison to 10 ft. s. of n. of Elizabeth.....	8
" Elizabeth to s. line of Adelaide.....	4
" crossing s. side of Adelaide.....	6
" 15 ft. n. of s. of Adelaide to 21 ft. s. of n. of Edmund.....	10
" Edmund to Watson.....	24
" Watson to Benton.....	6
" 15 ft. n. of s. of Benton to 28 ft. s. of n. of Rowena.....	8
" Brady to 3 ft. n. of s. of Alexandrine.....	8
" 3 ft. n. of s. of Alexandrine to 230 ft. n. of Milwaukee.....	6
" 230 ft. n. of Milwaukee to 24-in. main in N. Boulevard.....	8
" crossing Palmer, both sides.....	4
" Horton to Hamlin.....	4
" crossing Chandler.....	6
Bryant st., e. from Wabash 126 ft.....	6
" 126 ft. e. of Wabash to Twelfth.....	4
Buchanan st., Livernois to Vinewood.....	16
" Vinewood to Grand River.....	30
" Twenty-eighth to Scotten.....	4
" Twenty-fourth to Twenty-third.....	4
" Williams to e. line of Maybury.....	4
" e. line of Maybury to 75 ft. e. of Sullivan.....	3
" 387 ft. w. of Humboldt to Eighteenth.....	4
" 169 ft. w. of, to Seventeenth.....	4
" Fifteenth to Wabash.....	4
" alley s. of, Joe to Howell.....	6
Burns ave., Jefferson from 42-in. main n. 435 ft.....	10
" 42-in. main in Champlain to n. line of St. Paul.....	12

Burlage pl., Waterloo to Cleveland.....	3
Burlingame ave., Woodward 16-in. main to 1,264 ft. w. of same.....	6
Burrell pl., 26 ft. w. of e. of Maybury to 212 ft. e. of Sullivan.....	6
Bushey st., Michigan to 21 ft. n. of s. of Julia.....	6
Butternut st., Twenty-fourth to Fifteenth.....	24
" Williams to 227 ft. e. of Maybury.....	4
" e. from Seventeenth 144 ft.....	4
" e. from Wabash 263 ft.....	4
" National to alley w. of Trumbull.....	4
" alley e. of Trumbull to Seventh.....	4
C st., Hubbard to Vinewood.....	4
Cadillac ave., Pumping Works to Mack.....	42
" crossing Jefferson to n. line.....	6
" 1,640 ft. n. of to 2,050 ft. n. of Jefferson.....	6
" 96 ft. s. of to Harper.....	6
Cadillac square, s. side, Woodward to Randolph.....	24
" n. side, Monroe to Bates.....	6
" alley n. of, from second alley e. of Woodward to Randolph.....	4
" alley s. of, alley e. of Woodward to Bates.....	4
Cadillac Park, 233 ft. w. from Bates to 120 ft. e. of same.....	4
Calumet ave., w. line of Twelfth to 196 ft. e. of same.....	4
" crossing Lincoln.....	4
" Eighth to Fourth.....	4
" Grand River to Third.....	20
Calvert ave., crossing Woodward to w. line.....	6
Cameron ave., 24-in. main to 122 ft. n. of N. Boulevard.....	6
" 122 ft. n. of N. Boulevard to Clay.....	4
" Clay to 23 ft. n. of Koch.....	6
" 26 ft. s. of n. of Haigh to 30 ft. n. of n.....	6
Campau st., River st. to Fort.....	6
" n. from Dix 448 ft.....	4
Campbell ave., River st. to Dunn.....	6
" Michigan to 161 ft. n. of Herbert.....	6
Canfield ave., Thirteenth to 48 ft. e. of same.....	4
" 48 ft. e. of Thirteenth to Twelfth.....	2
" crossing Seventh.....	4
" e. line of Seventh to Sixth.....	2
" Greenwood to Fourth.....	4
" Third to Woodward.....	4
" Third to Woodward.....	20
" Woodward to Collins.....	42
" Woodward to 767 ft. w. of Mt. Elliott.....	6
" 767 ft. w. of, to Mt. Elliott.....	4
" Canton to 9 ft. w. of Helen.....	6
" alley s. of, from Hastings to alley e. of same.....	2
Caniff ave., 16-in. main to w. line of Woodward.....	6
" w. of w. line of Woodward 27 ft.....	4
Canton ave., Jefferson to 210 ft. n. of Kercheval.....	6
" crossing Mack.....	6
" 23 ft. s. of n. of Stuart to Gratiot.....	6
" Hancock to 168 ft. n. of Frederick.....	6
" Medbury to Piquette.....	6
" crossing N. Boulevard.....	6
Caroline st., Thirteenth to 192 ft. w. of Twelfth.....	6
" 192 ft. w. of to Twelfth.....	3 & 4
Cass st., Woodbridge to Jefferson.....	2
" Jefferson to Fort.....	24
" alley n. of Michigan to Spencer.....	4

	LOCATION.	DIAM. INCHES.
Cass st.,	alley w. of, from alley s. of Spencer to Lewis.....	4
Cass ave.,	Jefferson to Columbia.....	10
"	Columbia to Gilman.....	16
"	Gilman to Joy.....	10
"	Joy to Alexandrine.....	8
"	Alexandrine to 16 ft. s. of s. line of Canfield.....	6
"	crossing Canfield 48 ft.....	8
"	32 ft. n. of s. of Canfield to 19 ft. n. of n. of Warren.....	6
"	19 ft. n. of Warren to 34 ft. n. of s. of Kirby (east).....	10
"	Kirby (east) to Kirby (west).....	12
"	21 ft. n. of s. of Kirby (west) to 20 ft. n. of s. of Holden.....	10
"	20 ft. n. of s. of Holden to 118 ft. s. of D. & B. C. R. R.....	6
"	118 ft. s. of D. & B. C. R. R. to Milwaukee.....	8
"	s. line of N. Boulevard to 24-in. main.....	8
"	w. side, crossing Forest and Putnam.....	4
"	alley w. of, alley s. of Elizabeth to 119 ft. s. of Gilman.....	4
"	alley w. of 119 ft. s. of to Gilman.....	3
"	alley w. of Ledyard to Bagg.....	4
Catherine st.,	Gratiot to Hastings.....	12
"	Hastings to Rivard.....	4
"	crossing Rivard.....	6
"	Rivard to w. line of Dequindre.....	4
"	w. line of Dequindre to e. line of St. Aubin.....	6
"	crossing Jos. Campau.....	6 & 8
"	e. line of St. Aubin to Elmwood.....	4
Cavalry ave.,	36 ft. s. of n. of Fort to 18 ft. n. of s. of Celeron.....	6
"	Lafayette to Amherst.....	6
"	Regular to n. line of Dix.....	6
"	n. line of Dix to Toledo.....	4
Celeron st.,	274 ft. w. of Campbell to Junction.....	4
"	19 ft. w. of e. of Cavalry to 231 ft. e. of same.....	6
Cella st.,	Wabash to 4 ft. e. of e. line of same.....	4
"	4 ft. e. of e. of Wabash to Thirteenth.....	3
"	Thirteenth to Twelfth.....	4
Champlain st.,	Randolph to St. Aubin.....	30
"	Randolph to alley e. of same.....	4
"	St. Antoine to Orleans.....	4
"	Orleans to Elmwood.....	6
"	Elmwood to 250 ft. w. of Leib.....	4
"	250 ft. w. of to Leib.....	3
"	30-in. main in Chene st. to Iroquois.....	42
"	(in line of), from Iroquois through private property to intersection of Crane and Jefferson.....	42
"	alley s. of, alley e. of Randolph to St. Antoine.....	4
Chandler ave.,	Woodward to Oakland.....	6
Charles st.,	Seventh to Sixth.....	4
Charlevoix st.,	Chene to e. line of Jos. Campau.....	4
"	e. line Jos. Campau to alley w. of McDougall.....	3
"	alley e. of McDougall to Elmwood.....	4
"	Ellery to Mt. Elliott.....	4
"	142 ft. w. of, to Concord.....	4
Charlotte ave.,	Fifth to 131 ft. w. of Fourth.....	4
"	131 ft. w. of, to Fourth.....	3
"	alley e. of Third to Woodward.....	4
Chase st. (Delray),	6-in. main in River st. s, 477 ft.....	4
Chase st.,	crossing Russell, e. side.....	4
"	e. line of Russell to w. line of Riopelle.....	3

PIPE CONSTRUCTION, 1895.—CONTINUED.

DATE.	LOCATION.	DIAMETER IN INCHES.									
		3	4	6	8	10	12	24	42		
June 21	Twenty-first st., s. to n. line of Foster.									50	
July 26	Twenty-sixth st., 34 ft. n. of s. of Brown to 36 ft. n. of s. of Grand River.			1,646							
August 12	Twenty-fifth st., 64 ft. s. of s. of Hudson to 125 ft. s. of same.			61							
April 19	Warren ave., 35 ft. e. of w. of Fourteenth to 7 ft. s. of e. of alley e. of			315							
June 11	" " e. line of Mt. Elliott to 178 ft. s. of s. of same.			178							
July 31	" " 17 ft. e. of w. of DeLooff st. to 65 ft. s. of same.			86							
May 24	Waterloo, crossing w. side of Mt. Elliott.									16	
May 17	Woodward ave., alley w. of s. ft. n. of alley n. of State to 34 ft. n. of s. of Clifford									1,028	
September 16	" " crossing n. s. of Clifford.			25						310	
September 19	" " alley w. of Congress to 2 ft. s. of s. of alley s. of Fort.										
October 21	" " alley w. of 8 ft. n. of s. of alley s. of Larned to 21 ft. s. of n. of Larned.									180	
June 6	Willis ave., 102 ft. e. of e. of Collins to w. line of Moran.			518							

To this report I again append the number of hydrants and reservoirs added to the pipesage. The following is as reported by Mr. James F. Tryon, Secretary of the Fire Department:

Hydrants 116, reservoirs 21, making the total number now in use, 2,994 hydrants and 341 reservoirs.

PIPEAGE OF THE CITY OF DETROIT,

JANUARY, 1896.

ALPHABETED BY STREETS, SHOWING THE SIZE OF IRON
PIPE IN USE.

LOCATION.	DIAM. INCHES.
A st., e. from Scotten 78 ft.....	4
" Hubbard to Vinewood.....	4
Aberle ave., e. from Russell 349 ft.....	4
Abbott st., Tenth to Cass	24
" w. from Third 20 ft.....	6
" alley s. of, crossing Sixth.....	6
" alley s. of, 196 ft. e. of e. of Twelfth to Cass.....	4
Adair st., the river to 10 ft. n. of s. of Jefferson.....	6
" 10 ft. n. of s. to 29 ft. n. of s. of Jefferson.....	4
Adams ave., John R. to Randolph.....	6
" Witherell to Hastings.....	4
" alley s. of Cass to 240 ft. e. of Clifford.....	4
" alley s. of, John R. to Randolph.....	4
Adelaide st., 30 ft. e. of w. of Woodward to 22 ft. e. of w. of Brush... 8	
" 22 ft. e. of w. of Brush to 24 ft. e. of w. of Beaubien..... 10	
" 24 ft. e. of w. of Beaubien to Orleans..... 4	
" Orleans to 11 ft. e. of e. of same..... 18	
" 11 ft. e. of e. of Orleans to Gratiot..... 10	
" crossing Gratiot	8
Adele st., 23 ft. w. of e. of Chene to 8 ft. w. of w..... 6	
Agnes ave., E. Boulevard to Field..... 4	
" Baldwin to Seyburn..... 6	
" 21 ft. w. of e. of Seminole to 20 ft. w. of e. of Iroquois... 8	
Albert st., Hammond to Wesson..... 6	
Alexandrine ave., Grand River ave. main, to alley w. of Common- wealth	6
" alley w. of Commonwealth to alley w. of Trumbull 4	
" alley w. of Trumbull to Seventh..... 6	
" Seventh to Sixth..... 4	
" Greenwood to 150 ft. w. of Fourth..... 4	
" 150 ft. w. of Fourth to Fourth..... 3	
" Third to Cass..... 4	
" Cass to Woodward..... 6	
" Woodward to John R..... 4	
" John R. to 143 ft. w. of w. of Brush (center of st.) 6	
" 143 ft. w. of, to Brush (center of street)..... 4	
" 143 ft. w. of, to 34 ft. e. of e. of Brush (south lawn) 6	
" 34 ft. e. of e. of Brush to Beaubien..... 4	
" Beaubien to 15 ft. w. of w. of St. Antoine..... 3	

LOCATION.		DIAM. INCHES.
Alexandrine ave., 15 ft. w. of w. of St. Antoine to 20 ft. w. of e. of		
same	4	
" 20 ft. w. of e. of St. Antoine to Russell.....	6	
" Russell to alley w. of Dubois.....	4	
" alley w. of Dubois to Chene, w. line.....	3	
" w. line of Chene to w. line of Grandy.....	4	
" crossing Grandy	3	
" McDougall to alley e. of.....	6	
" alley e. of McDougall to 367 ft. e. of e. of Moran....	4	
Alfred st., from 30 ft. e. of w. of Woodward 16 ft. w. of e. of John R..	3	
" from 16 ft. w. of e. of John R. to e. line of Brush.....	6	
" from e. line of Brush to Russell.....	4	
" Russell to Orleans	3	
" Orleans to Dubois	4	
Alger ave., 16 in. main to e. line of Woodward.....	6	
" e. from Woodward 514 ft.....	4	
" from 514 ft. e. of Woodward to 108 ft. e. of e. of John R....	6	
" Russell to 443 ft. e. of Greeley.....	6	
Amherst st., 23 ft. e. of w. of Cavalry to 314 ft. w. of Junction.....	6	
" 314 ft. w. of w. to Junction.....	4	
Amsterdam st., 44 ft. w. of e. of Second to 44 ft. w. of w. of Cass....	6	
" 44 ft. w. of w. to e. line of Cass.....	4	
" e. line of Cass to w. line of Woodward.....	6	
" crossing Woodward, west side.....	4	
Annexation st., Junction to 540 ft. e. of e. of same.....	4	
Anthon st., 260 ft. w. of Campbell to 360 ft. w. of Junction.....	6	
" 360 ft. w. of w. to 30 ft. w. of e. of Junction.....	4	
Antietam st., Rivard to 22 ft. w. of w. of McDougall.....	4	
" crossing Jos. Campau.....	6	
Antoinette st., crossing Eighteenth, east side.....	4	
" e. line of Eighteenth to 28 ft. e. of w. of Stanton.....	6	
" Fifteenth to 223 ft. w. of Fourteenth.....	6	
" 223 ft. w. of, to Fourteenth.....	4	
" Fourteenth 138 ft. w. of Wabash.....	6	
" 138 ft. w. of, to Wabash.....	4	
" 193 ft. w. of, to Twelfth.....	4	
" 43 ft. w. of e. to e. line of Second.....	4	
" e. line of Second to Cass.....	6	
Arlington pl., Cass to Woodward.....	4	
Arndt st., Gratiot to 6 ft. w. of w. of Elmwood.....	6	
" 6 ft. w. of w. of Elmwood to Mt. Elliott.....	4	
Artillery ave., n. from River st. to Battery.....	6	
" crossing Fort	6	
" 78 ft. s. of s. to n. line of Lafayette.....	6	
" 477 ft. s. of s. of main in Dix.....	3	
Ash st., Vinewood to Twenty-seventh.....	4	
" Twenty-fourth to e. line of Tillman.....	4	
" Maybury to 250 ft. e. of e.....	4	
" 250 ft. e. of e. of Maybury to Sullivan.....	3	
" Sullivan to Humboldt	4	
" Humboldt to 166 ft. e. of e. of same.....	3	
" 166 ft. e. of e. of Humboldt to e. line of Eighteenth.....	4	
" e. line of Eighteenth st. to Seventeenth, w. line.....	3	
" w. line of Seventeenth to e. line of Sixteenth.....	4	
" crossing Fifteenth	4	
" 148 ft. w. of w. to Wabash.....	4	
" alley e. of Wabash to Twelfth.....	6	

LOCATION.	DIAM. INCHES.
Ash st., Twelfth to Harrison.....	4
" National to alley w. of Trumbull.....	6
" alley e. of Trumbull to Grand River.....	4
Atkinson ave., 16 in. main to 21 ft. w. of Woodward.....	6
Atwater st., Shelby to 8 ft. w. of w. of Brush.....	6
" 8 ft. w. of w. of Brush to 149 ft. e. of e. of Rivard.....	4
" 149 ft. e. of Rivard to 33 ft. w. of e. of McDougall.....	6
" alley s. of, alley w. of Bates to Randolph.....	4
Audrain st. (in line of), Clippert to Michigan Brass & Iron Works, 1,806 ft. (outside of city limits)	4
Aurelia st., w. line of Thirteenth to Twelfth.....	4
Avery ave., 21 ft. n. of s. of Willis to 345 ft. n. of Kirby.....	6
" s. from Piquette 104 ft.....	6
" alley w. of, Alexandrine to alley s. of Willis.....	4
" alley w. of, Lysander to Lombard terrace.....	6
B st., 213 ft. w. of, to Vinewood.....	4
Bagg st., Fifteenth to Woodward	24
" crossing Greenwood on e. side.....	4
" e. line of Greenwood to Fifth	3
Bagley ave., Grand River to Park.....	8
" alley e. of, Cass to alley s. of Park.....	4
Baker st., Scotten to Hubbard.....	4
" crossing e. side of Vinewood.....	6
" Vinewood to Twenty-fifth.....	4
" crossing Twenty-fifth, e. side.....	6
" Twenty-fifth to Twenty-fourth.....	4
" Twenty-fourth to Seventh.....	8
" Eighth to Seventh.....	4
" alley s. of, Fourteenth to Wabash.....	4
" alley s. of, Tenth to Eighth.....	4
" alley s. of, Eighth to alley w. of Fourth.....	4
Baldwin ave., Jefferson to Waterloo.....	6
" from Mack s. 267 ft.....	6
" Mack to Gratiot.....	10
" Gratiot to Harper.....	8
Baltimore ave., w. from Sullivan 297 ft.....	4
" from Lincoln to w. line of Greenwood.....	6
" Greenwood to Woodward.....	4
" Woodward to w. line of Brush.....	3
" crossing Brush w. side 41 ft.....	6
" alley s. of, Greenwood to Forsyth.....	6
Bancroft ave., 16 in. main, to w. line of Woodward.....	6
Bates st., Atwater to Farmer.....	6
" from Congress to Champlain.....	30
" alley e. of, n. line of Atwater to alley s. of Woodbridge....	3
Battery st., Artillery to Dragoon.....	6
Beacon st., crossing Brush, e. side.....	6
" Brush to 211 ft. e. of St. Antoine.....	4
Beals ave., s. from Mack 1,628 ft.....	6
Beaman st., Crane to alley w. of.....	4
Beaubien st., from Atwater to Champlain, s. line.....	6
" s. line Champlain to 4 ft. s. of n. of alley n. of.....	8
" alley n. of Champlain to Clinton.....	6
" Clinton to s. line of Gratiot.....	4
" crossing Gratiot, s. side.....	6
" Gratiot to 14 ft. s. of n. line Madison.....	8
" Madison to 23 ft. s. of n. line of Elizabeth.....	4

	LOCATION.	DIAM. INCHES.
Beaubien st.	31 ft. s. of n. line of Elizabeth to 28 ft. n. of s. line of Columbia 12	
"	28 ft. n. of s. of Columbia to 16 ft. n. of s. of Adelaide... 10	
"	crossing Adelaide, n. side..... 6	
"	n. line Adelaide to Watson..... 4	
"	Watson to Harper..... 10	
"	Harper to s. line of Boulevard..... 6	
"	crossing Boulevard, s. side..... 10	
"	47 ft. s. of n. of Boulevard to Custer..... 6	
Beaufault ave.,	n. from Jefferson 585 ft..... 6	
"	585 ft. n. of Jefferson to 225 ft. s. of Champlain..... 4	
"	225 ft. s. of Champlain to 263 ft. n. of Kercheval..... 6	
"	s. line of Mack to 190 ft. n. of n. of Forest..... 6	
"	crossing N. Boulevard 6	
Beaver st.,	Vinewood to Twenty-seventh..... 4	
Beech st.,	Seventh to First..... 4	
Bellevue ave.,	Jefferson to 251 ft. n. of n. of Stuart..... 3	
"	crossing Gratiot 6	
"	Gratiot to 25 ft. s. of s. of Frederick..... 4	
"	25 ft. s. of s. of Frederick 100 ft. n. of n. of same..... 6	
"	crossing N. Boulevard..... 3	
Belmont ave.,	16-in. main to e. line Woodward..... 6	
"	30 ft. w. of w. of to Oakland..... 6	
Belvidere ave.,	crossing Jefferson, n. side..... 10	
"	n. from Jefferson to 235 ft. n. of n. line..... 6	
"	30 ft. s. of n. of St. Paul to 535 ft. n. of Lorman..... 6	
"	crossing s. side of Mack to 177 ft. s. of same..... 6	
Benton st.,	Brush to 8 ft. w. of e. line of Beaubien..... 3	
"	from Beaubien to Russell..... 4	
Berlin st.,	Gratiot to Jos. Campau ave..... 3	
"	crossing Jos. Campau ave..... 4	
"	Jos. Campau to alley w. of McDougall..... 6	
"	alley e. of McDougall to Elmwood..... 3	
"	crossing Elmwood 4	
"	Ellery to Mt. Elliott 4	
Bethune ave.,	Hamilton Boulevard to Woodward..... 6	
Biddle st.,	Vinewood to Twenty-seventh..... 4	
Blaine ave.,	16-in. main to w. line Woodward..... 6	
"	w. from Woodward 1,616 ft..... 4	
Boone st.,	E. Boulevard 31 ft. e. of e. of same..... 6	
"	214 ft. w. of Collins to w. line of same..... 4	
"	11 ft. e. of e. of Collins to 234 ft. w. of w. of Moran..... 6	
"	234 ft. w. of, to Moran..... 4	
Boulevard, between	Fort and Myrtle, see W. Boulevard.	
"	Twenty-seventh and Hubbard, see Myrtle Boulevard.	
"	Myrtle and N. Boulevard, see Hubbard Boulevard.	
"	Hubbard Boulevard and McDougall, see N. Boulevard.	
"	N. Boulevard and Hendrie, see McDougall Boulevard.	
"	McDougall and Frontenac, see Hendrie Boulevard.	
"	Hendrie and Jefferson, see Frontenac Boulevard.	
Bowen ave.,	Jefferson to 50 ft. s. of Chapoton..... 6	
Bradley st.,	w. from Crane 211 ft..... 4	
Brady st.,	Woodward to 3 ft. w. of w. of Brush..... 6	
"	3 ft. w. of w. to 13 ft. w. of e. of Beaubien..... 3	
"	Beaubien to Russell 4	

LOCATION.	DIAM. INCHES.
Brainard st., Trumbull to e. line of Seventh.....	6
" e. line of Seventh to Sixth.....	4
" Greenwood to alley w. of Fourth.....	3
" alley w. of, to 16 ft. w. of e. of Fourth.....	4
" 16 ft. w. of e. of Fourth to 17 ft. e. of w. of Third.....	6
" Third to Cass.....	4
Brandon pl., 114 ft. w. of w. of to Moran.....	6
Brandon ave. (west), Campbell to Junction.....	6
" " Junction to Hubbard.....	4
Bratshaw st., 15 ft. w. of e. of Fourth to 28 ft. e. of w. of Third.....	10
Breckenridge st., w. from Humboldt 74 ft.....	4
" Humboldt to Eighteenth.....	6
" Eighteenth to 148 ft. w. of Sixteenth.....	4
" 148 ft. w. of Sixteenth to Sixteenth.....	6
" Fifteenth to 140 ft. w. of Fourteenth.....	6
" 140 ft. w. of, to Fourteenth.....	4
Brevoort pl., Twenty-second to alley e. of.....	6
" Nineteenth to alley w. of Eighteenth.....	4
Brewster st., crossing e. side of Brush.....	6
" e. line of Brush to Russell.....	4
" Riopelle to Gratiot.....	4
Brinket st., Crane to Hibbard.....	6
Bristol pl., Twenty-second to Twenty-first.....	4
Brown pl., 26 ft. w. of e. of Twenty-sixth, e. 146 ft.....	6
Bruce st., 2 ft. w. of alley w. of, to Crane.....	4
Brush st., Atwater to Jefferson.....	6
" crossing Jefferson.....	8
" Jefferson to Congress.....	4
" Congress to Gratiot.....	8
" Gratiot to 28 ft. n. of s. of Madison.....	4
" Madison to 10 ft. s. of n. of Elizabeth.....	8
" Elizabeth to s. line of Adelaide.....	4
" crossing s. side of Adelaide.....	6
" 15 ft. n. of s. of Adelaide to 21 ft. s. of n. of Edmund.....	10
" Edmund to Watson.....	24
" Watson to Benton.....	6
" 15 ft. n. of s. of Benton to 28 ft. s. of n. of Rowena.....	8
" Brady to 3 ft. n. of s. of Alexandrine.....	8
" 3 ft. n. of s. of Alexandrine to 230 ft. n. of Milwaukee.....	6
" 230 ft. n. of Milwaukee to 24-in. main in N. Boulevard.....	8
" crossing Palmer, both sides.....	4
" Horton to Hamlin.....	4
" crossing Chandler.....	6
Bryant st., e. from Wabash 126 ft.....	6
" 126 ft. e. of Wabash to Twelfth.....	4
Buchanan st., Livernois to Vinewood.....	16
" Vinewood to Grand River.....	30
" Twenty-eighth to Scotten.....	4
" Twenty-fourth to Twenty-third.....	4
" Williams to e. line of Maybury.....	4
" e. line of Maybury to 75 ft. e. of Sullivan.....	3
" 387 ft. w. of Humboldt to Eighteenth.....	4
" 169 ft. w. of, to Seventeenth.....	4
" Fifteenth to Wabash.....	4
" alley s. of, Joe to Howell.....	6
Burns ave., Jefferson from 42-in. main n. 435 ft.....	10
" 42-in. main in Champlain to n. line of St. Paul.....	12

Burlage pl., Waterloo to Cleveland.....	8
Burlingame ave., Woodward 16-in. main to 1,264 ft. w. of same.....	6
Barrell pl., 26 ft. w. of e. of Maybury to 212 ft. e. of Sullivan.....	6
Bashey st., Michigan to 21 ft. n. of a. of Julia.....	6
Batternut st., Twenty-fourth to Fifteenth.....	24
" Williams to 227 ft. e. of Maybury.....	4
" e. from Seventeenth 144 ft.....	4
" e. from Wabash 263 ft.....	4
" National to alley w. of Trumbull.....	4
" alley e. of Trumbull to Seventh.....	4
C st., Hubbard to Vinewood.....	4
Cadillac ave., Pumping Works to Mack.....	42
" crossing Jefferson to n. line.....	6
" 1,660 ft. n. of to 2,050 ft. n. of Jefferson.....	6
" 96 ft. s. of to Harper.....	6
Cadillac square, s. side, Woodward to Randolph.....	24
" n. side, Monroe to Bates.....	6
" alley n. of, from second alley e. of Woodward to Randolph.....	4
" alley s. of, alley e. of Woodward to Bates.....	4
Cadillac Park, 223 ft. w. from Bates to 120 ft. e. of same.....	4
Calumet ave., w. line of Twelfth to 196 ft. e. of same.....	4
" crossing Lincoln.....	4
" Eighth to Fourth.....	4
" Grand River to Third.....	20
Calvert ave., crossing Woodward to w. line.....	6
Cameron ave., 24-in. main to 122 ft. n. of N. Boulevard.....	6
" 122 ft. n. of N. Boulevard to Clay.....	4
" Clay to 23 ft. n. of Koch.....	6
" 26 ft. s. of n. of Haigh to 90 ft. n. of n.....	6
Campau st., River st. to Fort.....	6
" n. from Dix 448 ft.....	4
Campbell ave., River st. to Dunn.....	8
" Michigan to 161 ft. n. of Herbert.....	6
Canfield ave., Thirteenth to 48 ft. e. of same.....	4
" 48 ft. e. of Thirteenth to Twelfth.....	2
" crossing Seventh.....	4
" e. line of Seventh to Sixth.....	2
" Greenwood to Fourth.....	4
" Third to Woodward.....	4
" Third to Woodward.....	20
" Woodward to Collins.....	42
" Woodward to 767 ft. w. of Mt. Elliott.....	6
" 767 ft. w. of, to Mt. Elliott.....	4
" Canton to 9 ft. w. of Helen.....	6
" alley s. of, from Hastings to alley e. of same.....	2
Caniff ave., 16-in. main to w. line of Woodward.....	6
" w. of w. line of Woodward 27 ft.....	4
Canton ave., Jefferson to 210 ft. n. of Kercheval.....	6
" crossing Mack.....	6
" 22 ft. s. of n. of Stuart to Gratiot.....	6
" Hancock to 168 ft. n. of Frederick.....	6
" Medbury to Piquette.....	6
" crossing N. Boulevard.....	6
Caroline st., Thirteenth to 192 ft. w. of Twelfth.....	6
" 192 ft. w. of to Twelfth.....	2 & 4
Cass st., Woodbridge to Jefferson.....	8
" Jefferson to Fort.....	24
" alley n. of Michigan to Spencer.....	4

LOCATION.	DIAM. INCHES.
Cass st., alley w. of, from alley s. of Spencer to Lewis.....	4
Cass ave., Jefferson to Columbia.....	10
" Columbia to Gilman.....	18
" Gilman to Joy.....	10
" Joy to Alexandrine.....	8
" Alexandrine to 16 ft. s. of s. line of Canfield.....	6
" crossing Canfield 48 ft.....	8
" 32 ft. n. of s. of Canfield to 19 ft. n. of n. of Warren.....	6
" 19 ft. n. of Warren to 34 ft. n. of s. of Kirby (east).....	10
" Kirby (east) to Kirby (west).....	12
" 21 ft. n. of s. of Kirby (west) to 20 ft. n. of s. of Holden....	10
" 20 ft. n. of s. of Holden to 118 ft. s. of D. & B. C. R. R.....	6
" 118 ft. s. of D. & B. C. R. R. to Milwaukee.....	8
" s. line of N. Boulevard to 24-in. main.....	8
" w. side, crossing Forest and Putnam.....	4
" alley w. of, alley s. of Elizabeth to 119 ft. s. of Gilman....	4
" alley w. of 119 ft. s. of to Gilman.....	3
" alley w. of Ledyard to Bagg.....	4
Catherine st., Gratiot to Hastings.....	12
" Hastings to Rivard.....	4
" crossing Rivard	6
" Rivard to w. line of Dequindre.....	4
" w. line of Dequindre to e. line of St. Aubin.....	6
" crossing Jos. Campau.....	6 & 8
" e. line of St. Aubin to Elmwood.....	4
Cavalry ave., 36 ft. s. of n. of Fort to 18 ft. n. of s. of Celeron.....	6
" Lafayette to Amherst.....	6
" Regular to n. line of Dix.....	6
" n. line of Dix to Toledo.....	4
Celeron st., 274 ft. w. of Campbell to Junction.....	4
" 19 ft. w. of e. of Cavalry to 231 ft. e. of same.....	6
Cella st., Wabash to 4 ft. e. of e. line of same.....	4
" 4 ft. e. of e. of Wabash to Thirteenth.....	3
" Thirteenth to Twelfth.....	4
Champlain st., Randolph to St. Aubin.....	30
" Randolph to alley e. of same.....	4
" St. Antoine to Orleans.....	4
" Orleans to Elmwood.....	6
" Elmwood to 250 ft. w. of Leib.....	4
" 250 ft. w. of to Leib	3
" 30-in. main in Chene st. to Iroquois.....	42
" (in line of), from Iroquois through private property to Intersection of Crane and Jefferson.....	42
" alley s. of, alley e. of Randolph to St. Antoine.....	4
Chandler ave., Woodward to Oakland.....	6
Charles st., Seventh to Sixth.....	4
Charlevoix st., Chene to e. line of Jos. Campau.....	4
" e. line Jos. Campau to alley w. of McDougall.....	3
" alley e. of McDougall to Elmwood.....	4
" Ellery to Mt. Elliott.....	4
" 142 ft. w. of, to Concord.....	4
Charlotte ave., Fifth to 131 ft. w. of Fourth.....	4
" 131 ft. w. of, to Fourth.....	3
" alley e. of Third to Woodward.....	4
Chase st. (Delray), 6-in. main in River st. s, 477 ft.....	4
Chase st., crossing Russell, e. side.....	4
" e. line of Russell to w. line of Riopelle.....	3

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LOCATION.	DIAM. INCHES.
... crossing w. side of Riopelle.....	4
... crossing to a line of N. Boulevard.....	6
... crossing to Canfield.....	20
... crossing to Harrison.....	4
... crossing to alley w. of Trumbull.....	2
... alley w. of Trumbull to Seventh.....	4
... Seventh to Grand River.....	16
... crossing Jos. Campau.....	4
... crossing to alley w. of Eighteenth.....	4
... crossing Woodward from 16-in. main to e. line....	6
... crossing to 167 ft. w. of Grand River.....	6
... 25 ft. w. of, to Grand River.....	4
... crossing Morrell to Ferdinand.....	6
... Ferdinand to 122 ft. e. of e. of same.....	4
... 122 ft. e. of e. of Ferdinand to Lansing.....	6
... Lansing to 124 ft. e. of e. of same.....	4
... 124 ft. e. of e. of Lansing to McKinstry.....	6
... 173 ft. w. of Eleventh to 78 ft. w. of Tenth.....	6
... 78 ft. w. of Tenth to e. line of same.....	4
... alley s. of, Tenth to Eighth.....	4
... crossing 175 ft. w. of, to Hamilton Boulevard.....	6
... 1,375 ft. w. of w. of Woodward to w. line of same.....	4
... w. line to 16-in. main in Woodward.....	6
... River st. to s. line M. C. R. R.....	8
... s. line M. C. R. R. to Michigan.....	6
... Michigan-Peninsular Car Works to Michigan.....	4
... 29 ft. n. of s. of Rich (east) to 25 ft. n. of s. of Rich (west), 78 ft.	6
... 282 ft. w. of, to Scotten.....	4
... e. from Clark 282 ft.....	4
... n. and s. from 4-in. pipe 607 ft.....	2
... 16-in. main to 8-in. main in Woodward.....	8
... Woodward to Oakland.....	8
... Oakland to 363 ft. e. of St. Aubin.....	6
... St. Aubin to Elmwood.....	10
... Elmwood to Burlage pl.....	6
... crossing Greenwood, e. side.....	4
... e. from Greenwood 264 ft.....	2
... Sproat to Park pl.....	4
... alley w. of Griswold to e. line of Washington.....	4
... Washington to Woodward.....	12
... Gratiot to Rivard.....	10
... Rivard to Orleans.....	16
... Orleans to Elmwood.....	8
... alley s. of, alley w. of Brush to St. Antoine.....	4
... n. from Dennis 451 ft. (outside city limits).....	4
... Van Dyke to Parker.....	6
... crossing Russell, e. side.....	4
... Gratiot to Canfield.....	20
... Canfield to Griffin.....	20
... Leland to Canfield.....	4
... n. from Canfield 543 ft.....	4
... 543 ft. n. of Canfield to 26 ft. n. of Hancock.....	4
... s. from Harper 150 ft.....	6
... Park to Woodward.....	16
... Park to Woodward.....	4

LOCATION.	DIAM. INCHES.
Columbia st., Woodward to Rivard.....	6
" alley s. of, Cass to Woodward.....	6
Columbus ave., s. from Fort 570 ft.....	3
" crossing Fort	4
Commonwealth ave., crossing Grand River.....	6
" (west side), Alexandrine to Calumet.....	6
" crossing Forest, 42 ft.....	12
" both sides, crossing Hancock n. to s. line.....	6
" s. line of Putnam to Merrick.....	6
" s. line of Kirby to 7 ft. n. of Stanley.....	6
" 671 ft. s. of Piquette to Holden.....	6
Concord ave., Jefferson to Mack.....	6
" Sylvester to s. line of Harper.....	6
Conger st., 21 ft. e. of w. of Baldwin to 27 ft. w. of e. of Van Dyke....	6
Congress st., Sixth to Bates.....	30
" Randolph to St. Aubin.....	24
" St. Aubin to Meldrum.....	42
" Bates to Brush.....	4
" St. Antoine to Mt. Elliott, e. line.....	4
" 171 ft. w. of to Helen.....	4
" e. side Frontenac Boulevard to Field.....	4
" alley s. of, Seventh to Sixth.....	4
" alley s. of, Fourth to 250 ft. e. of same.....	4
" alley s. of, Third to Griswold.....	4
" alley s. of, 80 ft. w. of Brush to St. Antoine.....	4
Cook st., e. from Welch 289 ft.....	4
" 289 ft. e. of Welch to Hammond.....	6
Cracow pl., alley e. of Hastings to Rivard.....	6
Craig ave., n. from Trombly 378 ft.....	3
" 378 ft. n. of Trombly to Milwaukee.....	6
Crane ave., Jefferson to Mack.....	8
Crary st., 211 ft. w. of, to Crane.....	4
Crystal st., Trombly to Milwaukee.....	4
Custer ave., e. from Woodward 298 ft.....	4
" 298 ft. e. of Woodward to John R.....	6
" John R. to 307 ft. e. of same.....	4
" 307 e. of John R. to Brush.....	6
" Brush to Hastings.....	4
" Rivard to 126 ft. e. of same.....	4
" 126 ft. e. of Rivard to Russell.....	6
Cutler st., e. from McClellan 480 ft.....	4
D st., 300 ft. w. of, to Vinewood.....	4
Dalselle st., Twenty-fourth to Twenty-third.....	4
" Twenty-third to Twenty-second.....	6
" Twenty-second to Foundry.....	4
" Thirteenth to Twelfth.....	3
" crossing Twelfth	4
Dane st., crossing Collins, e. side.....	6
" e. line of Collins to 338 ft. e. of Moran.....	4
" crossing Mt. Elliott from w. to e. line.....	6
Davenport st., Cass to Woodward.....	4
Davis pl., Theodore to alley s. of same.....	4
Delaware ave., 300 ft. w. of w. line of Second ave. to 44 ft. w. of e. of Woodward	6
Deming st., e. from Scotten 368 ft.....	4
Dennis st., Clippert to Livernois (outside city limits).....	4

	LOCATION.	DIAM. INCHES.
Duquesne st.	Vanbridge to Jefferson.....	6
"	w. side Jay to Waterloo.....	4
"	" side Waterloo to Gratiot.....	4
"	" from Adelaide 286 ft.....	4
"	adjacent to Pierce.....	4
"	adjacent to Willis.....	4
"	alley 2 of 2 from Ferry 286 ft.....	4
Deloit ave.	crossing Hancock, n. side.....	3
"	Hancock to 50 ft. n. of n. of same.....	3
Dowdman st.	Thirty-first to Thirtieth.....	6
Dodge ave.	2. from Holden 627 ft.....	6
Dowdman st.	crossing Brush, e. side.....	6
"	" line of Brush to St. Aubin.....	4
Dt. ave.	adjacent to Twenty-fourth.....	10
"	n. side, crossing W. Boulevard 130 ft.....	6
"	crossing Twenty-third.....	6
Dodge ave.	2. from River st. 563 ft.....	6
"	Kemper to n. line of Dix.....	6
Dodge ave.	Campbell crossing w. side.....	6
"	Campbell to Junction.....	4
Dt. Jack st.	Swain to Lady's lane.....	4
Dodge st.	A. Water to Clinton.....	6
"	Clinton to Hunt.....	8
"	Hunt to n. line of Leland.....	6
"	2. line of Leland to s. line of Canfield.....	3
"	Canfield crossing s. side 40 ft.....	6
"	40 ft. n. of s. of Canfield to 26 ft. n. of s. of Farnsworth.....	16
"	Farnsworth, crossing n. side from 16-in. main to n. line 48 ft.....	8
"	n. line of Farnsworth to 188 ft. n. of Frederick.....	4
"	188 ft. n. of Frederick to Ferry.....	6
"	Ferry to Hendrie.....	4
"	Hendrie to 100 ft. s. of Medbury.....	6
"	100 ft. s. of Medbury to 30 ft. s. of Harper.....	4
"	30 ft. s. of Harper to 22 ft. n. of s. of Trombley.....	8
"	crossing N. Boulevard.....	8
Duffield st.	Cass to Woodward.....	4
Dunsmuir st.	e. from Crane 297 ft.....	4
"	297 ft. e. of to 126 ft. e. of Crane.....	6
Dusa st.	Wesson to Campbell.....	3
Durand st.	30 ft. w. of e. of Van Dyke to 272 ft. w. of w. of same.....	6
E st.	Hubbard to Vinewood.....	4
"	crossing W. Boulevard from 5 ft. e. of w. to 2 ft. w. of e.....	6
"	e. line of W. Boulevard to Twenty-sixth.....	6
"	Twenty-sixth to Twenty-fifth.....	6
Eastern pl.	35 ft. w. of e. of Twenty-sixth, e. 176 ft.....	6
Edison ave.	16-in main in Woodward to w. line of same.....	6
Edmund pl.	Woodward to Brush.....	24
Eighth st.	24 ft. s. of n. of River st. to 30 ft. n. of s. of Michigan.....	8
"	30 ft. n. of s. of Michigan to 3 ft. n. of n. of Orchard.....	6
"	3 ft. n. of n. of Orchard to Cherry.....	4
"	Grand River to Calumet.....	8
"	crossing s. side of Calumet 40 ft.....	6
"	Calumet to Lyander.....	4
Nineteenth st.	Fort to s. line of Myrtle.....	6
"	s. to n. line of Myrtle.....	7
"	Myrtle to 30 ft. n. of Linden.....	6

LOCATION.		DIAM. INCHES.
Eighteenth st., 50 ft. n. of, to 370 ft. n. of Linden.....	3	2
" 370 ft. n. of, to 468 ft. n. of Linden.....	4	4
" 468 ft. n. of Linden to n. line of Buchanan.....	6	6
" n. line of Buchanan to s. line of Hancock.....	4	4
" crossing s. side of Hancock.....	6	6
" Grand River to N. Boulevard (s. line).....	6	6
" crossing N. Boulevard.....	3	3
" n. from N. Boulevard 238 ft.....	6	6
" alley w. of, Brevoort to Webster pl.....	4	4
" alley w. of, St. Clair to Wing pl.....	4	4
" alley w. of, Chipman to Johnson.....	4	4
Eighteenth-and-a-half st., 1,677 ft. s. of River st. s. 160 ft.....	4	4
" s. from River st. 577 ft.....	3	3
" River st. to Fort.....	4	4
Eleventh st., Leverette to Michigan.....	6	6
Ellot st., Woodward to 20 ft. w. of e. of John R.....	6	6
" John R. to Riopelle.....	4	4
Ellery st., Waterloo to Charlevoix.....	6	6
" Arndt to Berlin.....	6	6
" Heidelberg to Schneider pl.....	6	6
" s. line of Mack to Gratiot.....	6	6
" crossing Hendrie Boulevard.....	6	6
Ellery pl., Forest to Hancock.....	3	3
Elisabeth st., Grand River to Cass.....	3	3
" 22 ft. e. of w. of Park to 20 ft. e. of w. of Brush.....	3	3
" Brush to Beaubien.....	4	4
" (both sides), alley e. of Woodward to 177 ft. w. of Brush.....	4	4
" Beaubien to St. Antoine.....	12	12
" St. Antoine to Hastings.....	4	4
" alley s. of, 100 ft. w. of Cass to Woodward.....	4	4
" alley s. of, alley e. of Woodward to Witherell.....	3	3
" alley s. of, John R. to Randolph.....	4	4
Elm st., alley e. of Wabash to Harrison.....	4	4
" Harrison to National.....	6	6
" National to alley w. of Trumbull.....	4	4
" alley e. of Trumbull to Seventh.....	4	4
Elmwood ave., Jefferson to Monroe.....	4	4
" Monroe to Maple.....	6	6
" Waterloo to Hunt.....	4	4
" Hunt to Gratiot.....	6	6
Emmons st., McClellan to Pennsylvania.....	4	4
Endicott ave., crossing e. side of Woodward.....	4	4
" crossing w. side of John R.....	6	6
Englewood ave., crossing Woodward, e. side.....	6	6
" e. line of Woodward to w. line of Oakland.....	4	4
" e. from w. line of Oakland 30 ft.....	6	6
Erie pl., crossing w. side of Moran 23 ft.....	6	6
Ersline st., Woodward to Russell.....	4	4
" Russell to 159 ft. w. of Riopelle.....	6	6
" 159 ft. w. of to Riopelle.....	4	4
" Dequindre to w. line of Chene.....	4	4
" w. line of Chene to Grandy.....	3	3
Euclid ave., 520 ft. w. of to Woodward.....	6	6
Exposition Grounds, s. from River st. 948 ft.....	4	4
F. st., 140 ft. w. of to Vinewood.....	4	4
" crossing roadway of Vinewood 27 ft.....	6	6
Fairbanks st., e. from Scotten 364 ft.....	4	4

	LOCATION.	DIAM. INCHES.
Pennet st.	Bates to Gratiot	6
-	15 ft. s. of to 38 ft. n. of 30-in. main in Gratiot.....	8
Pennworth st.	Woodward to Rivard	6
-	Rivard to Dubois	16
-	crossing e. side of Dubois.....	6
-	e. line of Dubois to Grandy.....	4
-	Mitchell to McDougall	4
-	crossing Collins	6
-	Collins to Moran	3 & 4
-	crossing e. side of Moran 29 ft.....	6
-	crossing Mt. Elliott from w. line to 14 ft. w. of e. 51 ft.	6
-	162 ft. w. of to Concord.....	6
-	Canton to Helen	4
-	crossing Frontenac Boulevard	6
-	alley s. of or first st. s. of, crossing w. side of Moran	6
Perrand st., e.	from McClellan 513 ft.....	6
Ferdinand st., n.	from River st. 976 ft.....	4
-	976 ft. n. of River st. to 403 ft. s. of s. line of Fort.....	6
-	403 ft. s. of s. of to Fort.....	4
-	Porter to 140 ft. n. of Christianity.....	6
-	300 ft. s. of to 309 ft. n. of Dix.....	6
Perry ave.	Woodward to Russell	4
-	Russell to St. Aubin	8
-	St. Aubin to Mitchell	4
-	80 ft. w. of w. of Collins to w. line of same.....	6
-	w. line of Collins to 82 ft. e. of e. of same.....	8
-	267 ft. w. of to Moran.....	4
-	crossing e. side Moran	6
-	crossing Mt. Elliott from 6-in. main to 4-in. main, 39 ft. 24 ft. e. of w. of to 222 ft. e. of e. of Helen.....	6
-	crossing Frontenac Boulevard	8
-	Townsend to Baldwin	6
-	alley s. of 163 ft. w. of to Secor pl.....	4
-	alley n. of from 20 ft. e. of w. of Hastings e. 403 ft.....	6
Field ave.,	Jefferson to 740 ft. n. of Waterloo.....	6
-	4 ft. s. of Mack to 177 ft. n. of Medbury.....	6
Fifth st.,	Congress to alley n. of	8
-	alley s. of to alley n. of Lafayette.....	4
-	Abbott to Cherry	6
-	Cherry to Noble	4
-	both sides of Elton and Crawford Parks.....	4
-	Holden to 144 ft. s. of Piquette.....	4
-	144 ft. s. of to Piquette.....	6
Fifteenth st.,	Fort to north line of Grand River.....	6
-	Bagg to Buchanan	24
-	n. from Warren 348 ft.....	6
-	Kirby to Harper	6
-	crossing N. Boulevard	6
Finley st.,	63 ft. w. of to Jos. Campau.....	4
First st.,	Front to Woodbridge	6
-	Woodbridge to alley n. of Jefferson	8
-	Jefferson to s. line of Congress	4
-	crossing Congress	8
-	n. line of Congress to Fort	4
-	Fort to Grand River	6

LOCATION.	DIAM. INCHES.
First st., alley w. of alley s. of to Spencer.....	4
" alley w. of alley s. of to Prentiss.....	4
Fischer ave., Jefferson to 90 ft. n. of Beaman.....	6
" crossing Mack from 42-in. main to 8-in. main.....	8
" n. from Mack 1,483 ft.....	6
Florence st., Harper to Piquette.....	4
Florence st., Shipherd to Van Dyke	6
Flower st., crossing Forest s. to n. line.....	4
" n. from Forest 260 ft.....	3
" 260 ft. n. of Forest to Hancock.....	6
Forest ave., Fourteenth to alley w. of Wabash	6
" 2 ft. w. of w. of Wabash to 190 ft. w. of Twelfth.....	6
" 190 ft. w. of Twelfth to Avery.....	4
" Avery to Commonwealth	6
" Commonwealth to Trumbull	8
" crossing Trumbull	4
" Lincoln to Seventh	6
" Seventh to Fourth	4
" Third to Cass, both sides.....	4
" Cass to 373 ft. w. of Rivard.....	4
" 373 ft. w. of to Rivard.....	6
" Russell to w. line of Dubois.....	4
" crossing Dubois from e. to w.....	6
" e. line of Dubois to 190 ft. w. of Grandy.....	4
" 190 ft. w. of Grandy to e. line of same.....	6
" McDougall to e. line of Collins.....	6
" e. line of Collins to Moran.....	4
" Moran to 157 ft. w. of Beaufait.....	6
" 157 ft. w. of to Beaufait.....	4
" e. from Baldwin 164 ft.....	4
" alley s. of St. Antoine to 374 ft. w. of Hastings.....	6
" alley s. of 374 ft. w. of to Hastings.....	4
Forsyth ave., Baltimore to alley s. of same.....	6
Fort st., w. line of Artillery to Twenty-fourth.....	8
" Twenty-fourth to Hoffman	6
" Hoffman to Fourteenth	8
" Fourteenth to Tenth	6
" 20 ft. w. of e. of Tenth to 21 ft. w. of e. of Seventh.....	12
" Seventh to Woodward	16
" Griswold to Woodward	4
" St. Antoine to Meldrum	4
" 168 ft. w. of to Helen.....	4
" alley s. of Eighth to Seventh.....	4
" alley s. of Seventh to Fifth.....	8
" alley s. of 10 ft. w. of Third to Cass.....	4
" alley s. of Cass to Shelby.....	6
" alley s. of Shelby to 16 ft. w. of e. line of Griswold.....	4
" alley s. of 16 ft. w. of e. line of Griswold to alley w. of Woodward	8
" alley s. of alley e. of Randolph to St. Antoine.....	4
Foundry st., Baker to Michigan.....	6
Fourth st., Woodbridge to Larned	4
" Larned to Congress	8
" Fort to Grand River.....	6
" alley w. of Labrosse to alley s. of Michigan.....	4
Fourth ave., Grand River to Baggs.....	4
" Baggs to Calumet	6

	LOCATION.	DIAM. INCHES.
Fourth ave.,	Calumet to s. line of Kirby.....	4
"	s. to n. line of Kirby	6
"	n. line of Kirby to 21 ft s. of n. of Bratshaw.....	4
"	21 ft. s. of n. of Bratshaw to 13 ft. s. of n. of Holden... 10	
"	alley w. of Brainard to alley n. of.....	4
"	alley w. of Seiden to alley s. of.....	4
"	alley w. of Lysander to Prentiss.....	3
Fourteenth ave.,	Fort to Lafayette.....	8
"	Lafayette to Bagg	10
"	Bagg to Grand River	8
"	Grand River to s. line of N. Boulevard.....	6
"	s. to n. line of N. Boulevard.....	8
"	(w. side) n. from Porter 402 ft.....	4
Fox st.,	Frank to Alexandrine.....	3 & 4
Frank st.,	Seventh to 23 ft. e. of w. of Sixth.....	6
"	Sixth to Fourth	4
Franklin st.,	Randolph to Beaubien	4
"	Beaubien to Orleans	6
"	Orleans to 25 ft. e. of Dequindre.....	4
"	25 ft. e. of Dequindre to McDougall	6
"	Walker to Adair	4
"	325 ft. w. of to Leib	4
"	alley s. of McDougall to Walker	4
Frederick st.,	Woodward to 124 ft. e. of Riopelle.....	4
"	124 ft. e. of Riopelle to 129 ft. e. of same.....	6
"	252 ft. w. of St. Aubin to Jos. Campau.....	4
"	Collins to 126 ft. e. of Moran.....	6
"	30 ft. w. of e. of Bellevue to 22 ft. e. of w. of Concord. 6	
"	Heien to 60 ft. w. of w. of Frontenac Boulevard.....	4
"	connecting two mains in Mt. Elliott ave.....	6
Freemont pl.,	Collins to 443 ft. w. of Moran.....	6
"	443 ft. w. of to Moran	4
Front st.,	Third to 107 ft. e. of same.....	6
"	Second 170 ft. e. of First.....	4
Frontenac Boulevard,	(w. side) s. from 42-in. main in Jefferson to B. I. Park	20
"	(w. side) crossing Jefferson ave. from main to n. line	6
"	(w. side) main in Mack to n. line.....	4
"	(w. side) s. line of Gratiot to n. side Hendrie Boulevard	6
"	(w. side) crossing Farnsworth, Ferry and Hendrie	8
"	(e. side) 424 ft. s. of to 220 ft. s. of Jefferson... 2	
"	(e. side) 220 ft. s. of Jefferson to 30 ft. s. of n. of St. Paul	6
"	(e. side) 30 ft. s. of n. of St. Paul to s. line of Waterloo	4
"	(e. side) s. line of Waterloo to 42-in. main in Mack	6
"	(e. side) s. of Mack crossing Boulevard 76 ft.... 6	
"	(e. side) 4-in. pipe to 18 ft. n. of n. line Mack... 4	
"	(e. side) 42-in. main in Mack to 27 ft. n. of s. line of Gratiot	10
"	(e. side) n. of 6-in. main from Gratiot n. 53 ft. 6	
"	(e. side) crossing Farnsworth st. and Hendrie Boulevard	6

LOCATION.	DIAM. INCHES.
Frontenac Boulevard, crossing Frontenac Boulevard s. of Jefferson 424 ft. s. of and 220 ft. s. of	3
Frontenac ave., s. from Medbury 93 ft.....	6
Galster st., Canfield to Forest	6
Garfield ave., Woodward to 367 ft. e. of e. of John R.....	4
" 367 ft. e. of e. of John R. to 10 ft. w. of Brush.....	6
" 10 ft. w. of Brush to e. line of Brush.....	4
" e. line of Brush to 222 ft. w. of Beaubien.....	6
" 222 ft. w. of Beaubien to e. line of St. Antoine.....	4
" e. line of St. Antoine to 346 ft. w. of Hastings.....	6
" 346 ft. w. of to Hastings	3
" Hastings to w. line of Dubois	4
" crossing Dubois w. to e. line.....	6
" e. line of Dubois to Chene, w. line.....	4
" w. line of Chene to e. line of Grandy.....	6
" e. from McDougall 218 ft.....	4
" crossing Collins	6
" 188 ft. w. of Galster to 213 ft. w. of Moran.....	6
" 213 ft. w. of to Moran.....	4
" crossing Moran e. side.....	6
" crossing Mt. Elliott 53 ft.....	6
" 182 ft. w. of to Beaufait.....	4
" alley s. of, St. Antoine to 374 ft. w. of Hastings.....	6
" alley s. of, 374 ft. w. of to Hastings.....	4
" alley s. of, Hastings to 335 ft. e. of same.....	3
Gillette ave., Greeley e. of 366 ft.....	6
Gilman st., Grand River to Cass.....	16
Gladstone ave., 803 ft. w. of to 16-in. in Woodward.....	6
Glynn ct., 300 ft. w. of to w. line of Woodward.....	4
" w. line of Woodward to 16-in main.....	6
Goethe st., Crane to Holcomb	4
" e. from McClellan 228 ft.....	4
Goldner ave., Michigan to G. T. R. R.	6
Grand River ave., Woodward to Cass.....	8
" Cass to Third	6
" Third to 400 ft. w. of Humboldt.....	8
" 400 ft. w. of Humboldt to Vinewood.....	6
" Vinewood to N. Boulevard	10
" N. Boulevard to city limits.....	6
" Calumet to Buchanan	30
" connecting 30-in. with 8-in. in Buchanan 22 ft....	8
" (s. side) Second to 56 ft. e. of Cherry.....	4
" (n. side) e. from Eighth 110 ft.....	3
" alley n. of, 10 ft. w. of Bagley to alley w. of Bagley	4
" alley north of, Fourth to Union	4
" alley n. of, w. from Lincoln 47 ft.....	4
" alley n. of, Trumbull to alley w. of same.....	6
" alley n. of, Wabash to alley w. of same.....	6
Grandy ave., Gratiot to Pierce.....	8
" Pierce to Harper	6
" N. from Harper 322 ft.....	4
" 322 ft. n. of Harper to Chene.....	6
Granger st., e. from Baldwin 259 ft.....	6
" 259 ft. e. of Baldwin to Van Dyke.....	4
Grant ct., n. from Warren 313 ft.....	4
Grant st., Thirteenth to Twelfth, w. line.....	3
" crossing w. side of Twelfth.....	4

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	LOCATION.	DEAM. INCHES.
Gratiot pl.,	Wabash to e. line of same.....	4
-	e. line of Wabash to Thirteenth.....	3
Gratiot ave.,	Woodward to Raynor	20
-	Raynor to w. line of Rivard (s.).....	10
-	w. line of Rivard (s.) to St. Aubin.....	12
-	Woodward to Brush	10
-	Brush to 64 ft. w. of Sheridan	6
-	64 ft. w. of Sheridan to 206 ft. w. of Harper.....	8
-	206 ft. w. of Harper to Cadillac	6
-	alley s. of, alley e. of Woodward to Farmer.....	4
-	alley s. of, Farmer to alley e. of Farrar.....	6
Greeley ave.,	Alger to Gillette.....	6
Greenwood ave.,	Bagg to Calumet	6
-	crossing Calumet	8
-	n. line of Calumet to N. Boulevard.....	6
Griffin st.,	see N. Boulevard	
Grisswald st.,	Detroit River to Atwater	3
-	Atwater to State	6
-	25 ft. n. of n. of Grand River to 16 ft. s. of s. of Clifford ..	8
-	16 ft. s. of s. line of Clifford to 12-in. main in Clifford....	10
Grammond ave.,	Hamilton Boulevard to 16-in. main in Woodward....	6
Guthrie st.,	Clay to Sidney	6
Guthrie st.,	Russell to Orleans	4
-	Orleans to McDougall	10
-	McDougall to Walker	6
Hale ave.,	16-in. main to e. line of Woodward.....	6
-	e. line of Woodward to 158 ft. e. of same.....	4
-	158 ft. e. of Woodward to 608 ft. e. of e. of same.....	6
-	22 ft. w. of e. of Cameron to 365 ft. e. of Greeley.....	6
Hale st.,	Riopelle to St. Aubin	6
-	e. from St. Aubin 275 ft.....	4
-	275 ft. e. of St. Aubin to Dubois.....	2
-	Dubois to Chene	4
-	Chene to Grandy	3
-	Grandy to Joa. Campau	6
Hamilton ave.,	Mack to 3 ft. s. of s. of Warren.....	6
Hamilton Boulevard,	crossing N. Boulevard.....	10
"	n. line of N. Boulevard to 26 ft. s. of s. line of Blaine	4
"	26 ft. s. of s. of Blaine to Bancroft.....	10
Hamlin ave.,	Woodward to Oakland	4
Hammond ave.,	Toledo to s. line of L. S. & M. S. R. R.....	6
"	356 ft. s. of Leavitt to 175 ft. n. of Ranspach.....	6
"	Poplar to Horatio	6
Hancock ave.,	Scotten to La Salle	4
-	crossing Hubbard Boulevard 165 ft.....	6
-	w. line of Vinewood to Twenty-sixth.....	4
-	Twenty-fifth to e. line of Twenty-fourth.....	4
-	Twenty-third to 155 ft. e. of e. line of same.....	4
-	155 ft. e. of e. of Twenty-third to 20 ft. w. of e. of Williams	6
-	Eighteenth to Seventeenth	4
-	crossing Fourteenth	4
-	Fourteenth to w. line of Wabash	3
-	w. line of Wabash to 130 ft. w. of Thirteenth.....	6
-	130 ft. w. of Thirteenth to Avery	4
-	Avery to Commonwealth	6

	LOCATION.	DIAM. INCHES.
Hancock ave.,	Commonwealth to Fourth	4
"	s. side e. from Third 10 ft.....	4
"	crossing Third	6
"	n. side e. from Third 461 ft.....	4
"	n. side 461 ft. e. of Third to Second.....	6
"	w. line of Cass to 112 ft. e. of Riopelle.....	4
"	483 ft. w. of to St. Aubin.....	6
"	St. Aubin to w. line of Dubois.....	4
"	crossing Dubois	8
"	281 ft. w. of Chene to Grandy	4
"	31 ft. e. of w. of Jos. Campau to 28 ft. w. of e. of Mitchell	6
"	Mitchell to McDougall	4
"	e. from McDougall 281 ft.....	6
"	crossing Collins	6
"	e. line of Collins to Detloff ct.....	4
"	Detloff ct. to alley w. of Ellery pl.....	6
"	alley w. of Ellery to alley w. of Mt. Elliott.....	4
"	crossing Mt. Elliott from w. to e. line.....	6
"	Canton to Helen	6
"	alley s. of Greenwood to Leroy pl.....	4
"	alley s. of alley e. of Riopelle to w. line of Orleans....	3
"	alley s. of crossing w. side of Orleans.....	4
Hanover ave.,	crossing Russell, e. side.....	4
Harmon ave.,	16-in. main to e. line of Woodward.....	6
"	e. line of Woodward to Oakland	4
Harper ave.,	Fifteenth to 134 ft. w. of Fourteenth.....	6
"	134 ft. w. of to Fourteenth.....	4
"	crossing Fourteenth	6
"	29 ft. w. of e. of Thirteenth to 176 ft. w. of Twelfth.....	6
"	176 ft. w. of to Twelfth.....	4
"	Woodward to Russell	4
"	Widman pl. to 184 ft. e. of Dubois.....	4
"	184 ft. e. of Dubois to w. line of Chene.....	6
"	w. line of Chene to 28 ft. w. of e. of Mitchell.....	4
"	28 ft. w. of e. of Mitchell to w. line of McDougall Boulevard	6
"	crossing McDougall Boulevard	8
"	crossing Collins	8
"	e. line of Collins to e. line of Mt. Elliott.....	6
"	Baldwin to 433 ft. e. of Van Dyke.....	6
"	Rohns to Holcomb	6
"	Gratiot to Cadillac	6
"	alley s. of, John R. to 350 ft. e. of same.....	4
"	alley s. of, crossing Brush.....	4
Harrison ave.,	crossing Michigan	12
"	Michigan to Grand River.....	4
"	alley w. of Linden s. to Linden n.....	4
Harvey ave.,	Junction to 500 ft. w. of Campbell.....	4
Hastings st.,	s. line to 16-in. main in Jefferson.....	16
"	Jefferson to Champlain	24
"	118 ft. s. of Congress to Fort.....	3
"	Champlain to Monroe	3
"	Congress to Clinton	6
"	Clinton to s. line of Mullett	4
"	crossing s. side of Mullett.....	8
"	Mullett to Catherine	12

	LOCATION.	DIAM. INCHES.
Hastings st.	Ducharme to Watson	6
"	Watson to Canfield	10
"	Canfield to Theodore	8
"	s. line of Farnsworth to s. line of Medbury	6
"	s. line of Medbury to Harper	8
"	Harper to Piquette	6
"	Piquette to s. line of Trombly	4
"	s. line of Trombly to s. line of N. Boulevard	6
"	crossing N. Boulevard	8
"	s. line of N. Boulevard to Custer	4
"	Custer to Marston	6
"	first alley e. of, alley s. of to 12 ft. s. of s. line of Canfield	3
"	first alley e. of, 12 ft. s. of s. to 21 ft. n. of s. line of Canfield	4
"	first alley e. of, first alley s. of Garfield to Cracow pl. ..	6
"	second alley e. of, second alley s. of Garfield to first alley s. of same	6
Hazel st.	Thirteenth to 36 ft. e. of same	4
"	36 ft. e. of Thirteenth to 156 ft. w. of Twelfth	3
"	28 ft. w. of Twelfth to Harrison	4
"	25 ft. w. of e. of Harrison to 25 ft. w. of e. of National ..	6
Hammond ave.	e. from 10-in. main in Hamilton Boulevard 28 ft. ..	6
"	13 ft. w. of e. of Hamilton Boulevard to w. line of Woodward	4
"	w. line of Woodward to 16-in. main	6
Hank pl.	crossing n. side of Forest	4
"	Forest to Hancock	2
Hera ave.	Merrick to 343 ft. n. of Kirby	4
"	67 ft. s. of s. of Piquette to Milwaukee	6
Hendberg st.	Joe Campau to alley e. of same	6
"	alley e. of McDougall to w. line of Elmwood	2
"	crossing Elmwood, w. side, 39 ft.	4
"	Elmwood to Mt. Elliott	6
Helen ave.	Jefferson to 91 ft. s. of s. of Macomb	6
"	crossing Mack	6
"	Gratiot to 152 ft. n. of Medbury	6
Hendricks st.	St. Aubin to Dubois	2
"	Dubois to alley w. of McDougall	4
"	alley e. of McDougall to Elmwood	4
"	Elmwood to 522 ft. w. of Mt. Elliott	6
"	522 ft. w. of to Mt. Elliott	4
Hermine ave.	Woodward to 550 ft. e. of John R.	4
"	550 ft. e. of John R. to w. line of Brush	6
"	crossing Brush and St. Aubin	4
"	crossing Hastings	6
"	Dubois to 224 ft. e. of same	6
"	224 ft. e. of Dubois to e. line of Chene	4
"	e. from e. line of Chene, 148 ft.	6
"	148 ft. e. of e. of Chene to e. line of Grandy	4
"	e. line of Grandy to e. line of McDougall	6
"	alley s. of, from 378 ft. w. of w. to 16 ft. w. of e. of Rivard	6
Hendrie Boulevard.	(s. side) crossing Collins, Ellery, Moran	6
"	22 ft. w. of e. of McDougall Boulevard to 12 ft. w. of e. of Collins	6

LOCATION.		DIAM. INCHES.
Hendrie Boulevard, 12 ft. w. of e. of Collins to 20 ft. w. of e. of Mt. Elliott	10	
" 20 ft. w. of e. of Mt. Elliott to 12 ft. e. of w. of Frontenac Boulevard	8	
" (s. side) crossing Mt. Elliott, Meldrum, Beaufait	6	
" (s. side) crossing Bellevue, Concord, Canton.....	6	
" (s. side) crossing Helen	6	
" (n. side) Mt. Elliott to e. side Frontenac ave....	8	
" Baldwin to 264 ft. e. of same.....	6	
" 264 ft. e. of Baldwin to 24 ft. w. of e. of Van Dyke	4	
" 24 ft. w. of e. of Van Dyke to w. line of Maxwell.	6	
Henrietta ave., crossing Campbell	6	
Henry st., alley e. of to Third.....	4	
" Third to Cass.....	6	
" Clifford to Woodward	4	
Herbert st., 134 ft. w. of Lovett to Scotten.....	4	
Hibbard ave., Jefferson to 202 ft. n. of Brinket.....	6	
High st., National to alley w. of Trumbull	3	
" alley w. of Trumbull to Fourth.....	4	
" Fourth to w. line of Third	3	
" w. line of to Third	4	
" Third to Grand River	6	
" Grand River to 26 ft. e. of e. of Woodward.....	4	
" 27 ft. e. of w. of Woodward to 3 ft. w. of e. of John R.....	8	
" 3 ft. w. of e. line of John R. to w. line of Beaubien.....	4	
" w. line of Beaubien to St. Antoine	6	
" St. Antoine to Russell	4	
" Russell to Riopelle	3	
Hoffman st., River st. to Fort.....	8	
Holborne ave., crossing Mt. Elliott, w. side.....	6	
" e. from Mt. Elliott 170 ft.....	4	
Holbrook ave., Woodward to 360 ft. e. of e. line of same.....	6	
Holcomb ave., Jefferson to Louis	6	
" Goethe to Mack	6	
" 274 ft. s. of s. of Gratiot to Harper.....	6	
Holden ave., Third to Cass.....	10	
" Cass to Woodward	6	
Holden road, Third to Fourth.....	4	
" Fourth to N. Boulevard s. line.....	8	
" s. line of to 24-in. main in N. Boulevard.....	10	
" Lincoln to Greenwood	4	
Homer st., w. from Crane 215 ft.....	4	
Hooker ave., e. from Grand River 63 ft.....	4	
" Sullivan to 596 ft. w. of Eighteenth.....	6	
" 596 ft. w. of to Eighteenth.....	4	
Horatio st., Livernols to Welch	4	
" Welch to Howell	6	
" Thirty-third to Thirty-second	6	
" Scotten to La Salle	6	
Horton ave., Woodward to Oakland.....	4	
Houghton ave., Holcomb to McClellan.....	4	
Howard st., Campbell to 343 ft. w. of Junction.....	6	
" 343 ft. w. of to Junction.....	4	
" Scotten to alley e. of	4	
" Twenty-fifth to Twenty-fourth	4	
" Twenty-fourth to w. side M. C. R. R. bridge.....	6	

LOCATION.	DIAM. INCHES.
Illinois st., w. line of Grandy to Jos. Campau.....	6
" e. from McDougall 241 ft.....	3
" 241 ft. e. of McDougall to 4 ft. w. of w. of Collins.....	4
" 4 ft. w. of w. of Collins to 4 ft. e. of e. of same.....	6
" 193 ft. w. of to Moran	4
Indiana st., Beaubien to Russell	8
Ingersoll st., e. from Wesson 228 ft.....	4
Iron st., Wight to Jefferson	6
Iroquois ave., 6 ft. s. of Champlain to 21 ft. s. of n. of Agnes.....	8
" 21 ft. s. of n. of Agnes to 2 ft. n. of n. of St. Paul.....	6
" alley e. of, 5 ft. n. of s. of alley n. of Jefferson to 115 ft. n. of same	4
Irving st., Seventh to Greenwood	4
Ivy pl., Twenty-third to Grand River.....	6
Jackson st., Thirty-fifth to Thirty-fourth.....	6
" Thirtieth to Twenty-ninth	6
" Twenty-ninth to e. line of Scotten	4
Jay st., Riopelle to 44 ft. w. of McDougall.....	4
" crossing Jos. Campau e. to, w. lines.....	6
Jefferson ave., First to Griswold	8
" Griswold to Orleans	10
" Dequindre to w. side of Belt Line R. R.....	6
" e. side of Belt Line to McClellan	6
" McClellan to e. city limits	10
" e. from e. city limits to 178 ft. e. of e. of entrance to Driving Park grounds	8
" 178 ft. e. of e. of Driving Park to 27 ft. w. of e. of Marshland road	6
" Second to Hastings	16
" Meldrum to pumping works (main No. 1).....	42
" Crane to pumping works (main No. 3).....	42
" alley s. of Cass to Shelby	4
" alley s. of, alley w. of Griswold to alley w. of Wood- ward	4
" alley s. of, alley w. of Bates to Randolph.....	4
" alley s. of Brush to Beaubien.....	3
" alley s. of, Beaubien to 189 ft. e. of same.....	4
" alley n. of, 15 ft. w. of e. of Parker to alley e. of Iroquois	4
Joe st., Michigan to alley s. of Buchanan	6
John R. st., Woodward to Miami.....	12
" n. side Miami to s. side of Madison.....	4
" n. side Madison to Adams	4
" Adams to Columbia	6
" Columbia to Edmund	8
" Edmund to s. line Rowena.....	6
" s. line Rowena to Brady.....	8
" Brady to s. line of Canfield.....	6
" crossing Canfield	8
" n. line Canfield to s. line of N. Boulevard.....	6
" crossing N. Boulevard, s. side.....	8
" Horton to Hamlin	6
Johnson st., Nineteenth to alley w. of Eighteenth.....	4
Jones st., Sixth to 160 ft. w. of Fifth.....	6
" 160 ft. w. of Fifth to Cass	4
Jos. Campau ave., Atwater to Clinton.....	6
" 25 ft. n. of s. of Catherine to 20 ft. n. of s. of Jay ..	8

	LOCATION.	DIAM. INCHES.
Jos. Campan ave.	Jay to a line of Gratiot	6
"	a line of Gratiot to St. Joseph	4
"	St. Joseph to Trombly	6
"	Trombly to 250 ft. n. of Milwaukee	4
"	250 ft. n. of Milwaukee to a line of N. Boulevard	6
"	crossing N. Boulevard	8
"	N. Boulevard to 3 ft. n. of Benton (w. side)....	6
"	alley e. of Muker	4
"	alley e. of Cleveland	2
"	alley e. of Hancock	4
"	alley e. of Huron	2
"	alley e. of Harrison	4
Josephine ave.	M. to main	6
Joy st.	Fifth to Fourth	4
"	Fourth to alley	6
"	alley e. of Thur	4
Julia st.	Wesson to main	6
Junction ave.	Ever	6
"	1st	8
Kanter ave.	Trumbull to main	6
"	1st to main	4
"	2nd to main	4
"	3rd to main	6
Karolava	1st to main	8
"	2nd to main	4
"	3rd to main	6
"	4th to main	4
"	5th to main	6
"	6th to main	4
"	7th to main	6
"	8th to main	4
"	9th to main	6
"	10th to main	4
"	11th to main	6
"	12th to main	4
"	13th to main	6
"	14th to main	4
"	15th to main	6
"	16th to main	4
"	17th to main	6
"	18th to main	4
"	19th to main	6
"	20th to main	4
"	21st to main	6
"	22nd to main	4
"	23rd to main	6
"	24th to main	4
"	25th to main	6
"	26th to main	4
"	27th to main	6
"	28th to main	4
"	29th to main	6
"	30th to main	4
"	31st to main	6
"	32nd to main	4
"	33rd to main	6
"	34th to main	4
"	35th to main	6
"	36th to main	4
"	37th to main	6
"	38th to main	4
"	39th to main	6
"	40th to main	4
"	41st to main	6
"	42nd to main	4
"	43rd to main	6
"	44th to main	4
"	45th to main	6
"	46th to main	4
"	47th to main	6
"	48th to main	4
"	49th to main	6
"	50th to main	4
"	51st to main	6
"	52nd to main	4
"	53rd to main	6
"	54th to main	4
"	55th to main	6
"	56th to main	4
"	57th to main	6
"	58th to main	4
"	59th to main	6
"	60th to main	4
"	61st to main	6
"	62nd to main	4
"	63rd to main	6
"	64th to main	4
"	65th to main	6
"	66th to main	4
"	67th to main	6
"	68th to main	4
"	69th to main	6
"	70th to main	4
"	71st to main	6
"	72nd to main	4
"	73rd to main	6
"	74th to main	4
"	75th to main	6
"	76th to main	4
"	77th to main	6
"	78th to main	4
"	79th to main	6
"	80th to main	4
"	81st to main	6
"	82nd to main	4
"	83rd to main	6
"	84th to main	4
"	85th to main	6
"	86th to main	4
"	87th to main	6
"	88th to main	4
"	89th to main	6
"	90th to main	4
"	91st to main	6
"	92nd to main	4
"	93rd to main	6
"	94th to main	4
"	95th to main	6
"	96th to main	4
"	97th to main	6
"	98th to main	4
"	99th to main	6
"	100th to main	4

LOCATION.	DIAM. INCHES.
Labrosse st., crossing e. side of Twelfth.....	6
" e. line of Twelfth to 430 ft. w. of Tenth.....	4
" 430 ft. w. of to Tenth.....	3
" Fifth to Fourth	4
" alley s. of alley e. of Twelfth to Fourth.....	4
Lady's lane, n. from Dry Dock st. 214 ft.....	4
Lafayette ave., Artillery to Dragoon	6
" Dragoon to 123 ft. e. of same.....	4
" 123 ft. e. of Dragoon to 315 ft. w. of Junction.....	6
" 315 ft. w. of to Junction	4
" crossing Clark	6
" e. from Scotten 256 ft.....	4
" 256 ft. e. of to 352 ft. e. of Scotten.....	6
" Twenty-fourth to e. line of Twenty-second.....	4
" Eighteenth to 110 ft. w. of w. line of Seventeenth....	6
" 110 ft. w. of w. of to Seventeenth.....	4
" alley w. of Sixteenth to Fifteenth.....	4
" Fifteenth to w. line of Fourteenth.....	3
" Fourteenth to Twelfth.....	4
" crossing Twelfth, e. side	6
" M. C. R. R. bridge to 743 ft. w. of Tenth.....	3
" 743 ft. w. of to Tenth.....	4
" Shelby to Griswold	4
" alley s. of, Tenth to Fifth.....	4
" alley s. of, Fourth to First.....	4
" alley s. of, First to Wayne.....	6
" alley s. of, Shelby to Griswold.....	6
Lafferty pl., Howard to s. side M. C. R. R.....	6
Lambie pl., crossing w. side of Twenty-third.....	4
" crossing from w. to e. of Twenty-second.....	4
" Twenty-second to Twenty-first.....	6
Lambert st., crossing e. side of Mt. Elliott.....	6
" Concord to Canton	4
" e. from Baldwin 235 ft.....	6
" 235 ft. e. from Baldwin to Van Dyke.....	4
Langley ave., Seventh to 141 ft. e. of e. of same.....	6
" 141 ft. e. of e. of Seventh to Fourth.....	4
Lanman st., crossing e. side of Vinewood.....	4
" e. side Vinewood to Twenty-seventh.....	6
Lansing ave., Fort to 159 ft. n. of Christiancy.....	6
" 331 ft. s. of Dix to Toledo.....	6
Larned st., First to Fourth.....	4
" Fourth to Third	8
" alley w. of to Woodward.....	8
" Third to Hastings	16
" Bates to Brush	4
" St. Antoine to Dequindre.....	4
" Riopelle to St. Aubin.....	12
" St. Aubin to w. line Elmwood.....	4
" w. line of Elmwood to 748 ft. e. of.....	6
" Leib to alley e. of.....	4
" w. line of Mt. Elliott to main, 26 ft.....	4
" Mt. Elliott to Meldrum 25 ft. w. of e.....	6
" w. from Helen 156 ft.....	4
" alley s. of, Third to First	8
" alley s. of, First to Griswold.....	4

LOCATION.		DIAM. INCHES.
Larned st.,	alley s. of, Shelby to Griswold	8
"	alley s. of, crossing Griswold (e. side) to 12 ft. w. of e. of same	4
"	alley s. of, 12 ft. e. of e. of Griswold to 8 ft. w. of e. of alley w. of Woodward	8
La Salle ave.,	Michigan to Horatio	6
"	Kirby to McGraw	6
Lauderdale ave.,	Campbell to 273 ft. w. of w. of Junction	6
"	273 ft. w. of to Junction	4
Laurel st.,	Wabash to Grand River	4
Lawrence ave.,	16-in. main in Woodward to 1,212 ft. w. of w. of same ..	6
Leach st.,	w. from Crane 215 ft.	4
Leavitt ave.,	Livernois to Wesson	4
Ledyard st.,	Third to Cass	6
Leib st.,	Wight to Jefferson	6
"	Jefferson to Champlain	4
"	42-in. main in Champlain to 18 ft. s. of n. of Monroe	8
Leicester st.,	16-in. main to e. line of Woodward	6
"	e. from Woodward 1,379 ft.	4
Leland st.,	2 ft. w. of e. of Brush to Beaubien	6
"	Beaubien to Russell	4
"	Russell to McDougall	8
"	McDougall to Collins	8
"	w. line of Collins to 6 ft. e. of e. of same	6
"	216 ft. w. of Moran to Gratiot	4
Lemay ave.,	Jefferson n. 607 ft (outside city limits)	6
Leroy pl.,	n. from Forest 251 ft.	8
Lessing st.,	e. from McClellan 158 ft.	4
Leverette st.,	Twelfth to Tenth	4
"	Eighth to Seventh	4
"	alley s. of, Tenth to Eighth	4
Lewis st.,	Fourth to Cass	4
"	alley s. of, alley e. of Third to Second	4
Lincoln ave.,	Grand River main to alley n. of	4
"	crossing Calumet n. side 36 ft.	8
"	n. line Calumet to Holden	6
"	crossing n. side Holden	8
"	n. line of Holden to Milwaukee	6
"	crossing s. side N. Boulevard 87 ft.	6
"	alley w. of, alley n. of Grand River to s. line of Brain- ard	4
"	alley w. of, s. line of Brainard to 30-in. main in Calumet ..	6
Linden st.,	36 ft. e. of Twenty-sixth to Twenty-fifth	4
"	Twenty-fourth to Tillman	4
"	Maybury to 137 ft. e. of e. of Humboldt	4
"	137 ft. e. of e. of Humboldt to Eighteenth	6
"	Eighteenth to Harrison	4
Livernois ave.,	Dix to M. C. R. R.	8
"	M. C. R. R. to n. city limits	10
Locust st.,	Wabash to Harrison	4
"	National to 30 ft. e. of same	4
"	30 ft. e. of National to alley w. of Trumbull	8
"	alley e. of Trumbull to Fourth	4
"	Fourth to Grand River	6
Lombard terrace,	alley w. of Avery to Twelfth	6
Longfellow ave.,	16-in. main to w. line of Woodward	6
Lorman ave.,	Crane to Belvidere	4

LOCATION.	DIAM. INCHES.
Lothrop ave., Hamilton Boulevard to Woodward.....	6
Louis ave., Crane to Holcomb.....	4
Lovett ave., Michigan to n. line of Buchanan.....	6
" Rich to 93 ft. n. of n. of Horatio.....	4
" 93 ft. n. of Horatio to 264 ft. n. of Herbert.....	6
" alley w. of, Visger to Jackson.....	6
Ludden st., Gratiot to Mt. Elliott.....	4
Lyman st., Crystal to Orleans.....	4
" 4 ft. w. of w. of Chene to 23 ft. w. of e. of same.....	6
Lysander st., crossing e. side Thirteenth 21 ft.....	6
" e. line of Thirteenth to Avery.....	4
" Lincoln to Seventh.....	4
" Seventh to w. line of Sixth.....	3
" crossing w. side Sixth.....	4
" Greenwood to Fourth.....	3
McArthur st., Vinewood to 70 ft. e. of e. of same.....	6
" 70 ft. e. of Vinewood to Twenty-seventh.....	4
McClellan ave., Jefferson to Marietta.....	6
" Marietta to Mack.....	8
" s. line of Mack to 144 ft. n. of Emmons.....	10
" n. from Gratiot 299 ft.....	8
McDougall ave., Atwater to Guoin.....	6
" Guoin to Wight.....	10
" Wight to Clinton.....	6
" crossing Waterloo, Cleveland and Arndt.....	8
" Preston to Gratiot.....	8
" Gratiot to Canfield.....	4
" Canfield to 187 ft. n. of Garfield.....	6
" 187 ft. n. of Garfield to Forest.....	8
" Forest to Hancock.....	6
" Theodore to Farnsworth.....	6
" Palmer to Hendrie.....	6
" alley e. of, Mullett to Chestnut.....	4
" alley e. of, Waterloo to s. line of Cleveland.....	3
" alley e. of, crossing Cleveland.....	4
" alley e. of, Cleveland to s. line of Arndt.....	3
" alley e. of, crossing Arndt.....	6
" alley e. of, n. line of Arndt to Preston.....	3
McDougall Boulevard, 22 ft. n. of s. of Hendrie Boulevard, to 29 ft. s. of n. of Griffin.....	6
McGraw ave., Scotten to 76 ft. e. of La Salle.....	4
" 76 ft. e. of La Salle to Twenty-sixth.....	6
" Twenty-sixth to Grand River.....	4
" Winslow to Sullivan.....	6
" Sullivan to Sixteenth.....	4
McGregor st., Campbell to Junction.....	6
McKinstry ave., River st. to n. line of Toledo.....	6
" Brandon to Plumer.....	6
" alley w. of, Plumer to alley s. of same.....	4
McMillan st., crossing Livernois, e. side.....	4
" Campbell to 319 ft. w. of Junction.....	6
" 319 ft. w. of to Junction.....	4
Mack ave., Riopelle to St. Aubin.....	6
" e. from St. Aubin 300 ft.....	4
" 100 ft. w. of to Dubois, w. line.....	3
" crossing Dubois.....	4
" e. line of Dubois to w. line Chene.....	3

	LOCATION.	DIAM. INCHES.
Medbury ave.,	364 ft. e. of e. of John R to 460 ft. e. of e. of same.....	3
"	22 ft. w. of e. of Brush to 123 ft. e. of e. of same.....	3
"	223 ft. w. of w. of St. Antoine to 149 ft. e. of e. of same	3
"	140 ft. w. of w. of Hastings to 168 ft. e. of e. of same...	3
"	194 ft. w. of w. of Rivard to 22 ft. w. of e. of same.....	3
"	22 ft. w. of e. of Rivard to e. line of same.....	4
"	730 ft. w. of to w. line of St. Aubin.....	3
"	w. line of St. Aubin to Jos. Campau.....	4
"	Mitchell to e. line of Collins.....	6
"	538 ft. w. of to 168 ft. e. of Mt. Elliott.....	6
"	Canton to Helen	6
"	Helen to Frontenac	4
"	Baldwin to Van Dyke.....	6
"	alley s. of, John R. to 350 ft. e. of same.....	4
"	alley s. of, crossing Brush.....	6
Melbourne ave.,	crossing e. side of Woodward.....	6
Meldrum ave.,	Wight to Jefferson	10
"	Jefferson to 46 ft. n. of Fort.....	6
"	46 ft. n. of Fort to 360 ft. n. of Kercheval.....	4
"	360 ft. n. of to 642 ft. n. of Kercheval.....	6
"	Arndt to Gratlot	6
"	168 ft. s. of Forest to 30 ft. n. of s. of same.....	6
"	crossing N. Boulevard	6
"	Jefferson to Congress	42
Merrick ave.,	Vinewood to Twenty-seventh.....	4
"	Twenty-third to Tillman.....	4
"	Tillman to Williams.....	6
"	27 ft. w. of e. of Maybury to 212 ft. e. of e. of Sullivan..	6
"	132 ft. w. of to Seventeenth.....	4
"	w. line of Wabash to Twelfth.....	6
"	Twelfth to 35 ft. w. of e. of Avery (s.).....	4
"	35 ft. w. of, e. of Avery (s.) to 26 ft. e. of w. of Avery (n.) 99 ft.	6
"	26 ft. e. of w. of Avery (n.) to Trumbull.....	4
"	Lincoln to e. line of Greenwood.....	4
"	26 ft. w. of e. of Seventh to 20 ft. w. of e. of Green- wood (in s. lawn).....	6
"	e. line of Greenwood to 136 ft. w. of Fourth.....	3
"	136 ft. w. of to Fourth.....	4
"	Third to 26 ft. e. of w. of Second.....	4
"	26 ft. e. of w. of Second to 21 ft. w. of e. of same.....	6
"	21 ft. w. of e. of Second to Cass.....	4
"	alley s. of, crossing e. side of Greenwood.....	4
"	alley s. of, e. line of Greenwood to alley w. of Fourth..	3
Miami ave.,	Gratlot to Witherell	16
"	n. side of, John R. to Witherell.....	4
"	alley w. of alley s. of to Gratlot.....	6
"	alley w. of Gratlot to 80 ft. s. of Witherell.....	4
"	alley e. of, Randolph to John R.....	4
Michigan ave.,	crossing W. Boulevard (s. side).....	6
"	Livernois to Twenty-fourth	6
"	Twenty-fourth to Foundry	8
"	Vinewood to Tenth	24
"	Tenth to First	8
"	First to Washington.....	10
"	Cass to Woodward.....	24
"	alley s. of, Cass to Shelby.....	4

LOCATION.	DIAM. INCHES.
Morrell st., River st. to 87 ft. n. of n. of Christianity.....	6
" 348 ft. s. of Dix to Toledo.....	6
" alley w. of 21 ft. n. of s. of Brandon to 4 ft. n. of s. of alley s. of Plumer.....	6
Mott ave., 16-in. main to e. line of Woodward.....	6
" e. from Woodward 558 ft.....	4
Mt. Elliott ave., 148 ft. s. of Wight to 286 ft. s. of Kercheval.....	6
" 286 ft. s. of Kercheval to Preston.....	8
" Preston to Mack	10
" Mack to Gratiot	8
" Gratiot to s. line of Hendrie Boulevard (e. side).....	4
" crossing Boulevard	8
" n. line of Boulevard to 300 ft. n. of Griffin.....	4
" 300 ft. n. of Griffin to Forest Lawn Cemetery.....	6
" Gratiot to Warren (w. side).....	6
" Harper to 123 ft. s. of (e. side).....	6
Mullett st., Gratiot to Chene	30
" St. Antoine to Elmwood.....	4
Mulberry st., Thirteenth to Twelfth.....	4
Myrtle Boulevard, Hubbard Boulevard to alley w. of Twenty-sixth....	6
Myrtle st., alley w. of Twenty-sixth to Grand River.....	6
Nall ave., crossing Vinewood	6
Napoleon st., Brush to w. line Beaubien.....	4
" crossing Beaubien	6
" e. line of Beaubien to Russell.....	4
National ave., Michigan to Grand River.....	6
Navarre st., McClellan to 425 ft. e. of e.....	6
Newark st., Twentieth to Nineteenth	6
Newberry ave., Cavalry to 341 ft. w. of Junction.....	6
" 341 ft. w. of to Junction.....	4
Newton ave., 1,264 ft. w. of to Jos. Campau.....	4
Newport ave., 70 ft. s. of n. of Jefferson to 397 ft. n. of same.....	6
Nineteenth st., Fort to Baker	4
" crossing Porter n. to s. line.....	6
" Baker to Newark	6
" alley w. of, 197 ft. s. of to Rose.....	3
Noble st., Seventh to Sixth	4
" Greenwood to 150 ft. w. of Fourth.....	4
" 150 ft. w. of to Fourth.....	3
Norton st., 283 ft. e. of to Wesson.....	4
" Thirty-first to 386 ft. e. of Junction.....	6
" 386 ft. e. of to Junction.....	4
N. Boulevard, 14 ft. w. of w. of Hubbard Boulevard to 10-in. main in Grand River	16
" Grand River 10-in. main to 30-in. main in Collins.....	24
" (n. side), 330 ft. w. of w. of Grand River to 639 ft. e. of e. of same	4
" (n. side), 1,103 ft. w. of w. of Sullivan to 100 ft. w. of same	4
" (n. side), 228 ft. w. of w. of Eighteenth.....	6
" (n. side), e. to w. line of Eighteenth.....	4
" (n. side), 5 ft. w. of w. of Woodward to 8-in. main and from 16-in. main to 3 ft. e. of e. of same.....	6
" (n. side), crossing Woodward between 8 and 16-in. mains ..	8
" (n. side), St. Aubin to 49 ft. e.....	4
" (n. side), 20 ft. e. of w. of Dubois e., 174 ft.....	4
" (s. side), 16 ft. w. of e. of Hubbard Boulevard to 9 ft. e. of e. of Grand River.....	4

	LOCATION.	DIAM. INCHES.
N. Boulevard	s. side), 33 ft. w. of e. of Sullivan to 146 ft. e. of same..	4
"	s. side), crossing Eighteenth and Fourteenth.....	4
"	s. side), 367 ft. w. of Twelfth to e. line.....	4
"	s. side), crossing Greenwood, e. side.....	4
"	s. side), 15 ft. w. of e. curb of Greenwood to 60 ft. e. of same.....	4
"	(s. side), 11 ft. e. of w. of Cass to 13 ft. e. of e. of same	4
"	(s. side), 8-in. main in Woodward to 100 ft. e. of Rivard.	4
"	(s. side), w. of w. of Chene 27 ft.....	4
"	(s. side), 40 ft. w. of e. of Mitchell to 64 ft. e. of e.....	4
Cad and ave.,	Piquette to Trombly.....	6
"	Milwaukee to s. line of Boulevard.....	4
"	s. line of N. Boulevard to 24-in. main, 87 ft.....	6
"	24-in. main in N. Boulevard to 27 ft. n. of s. of Horton..	10
"	Horton to Hamlin	6
"	Hamlin to Sidney	10
"	Belmont to Harmon	10
"	Harmon to 130 ft. n. of Woodland.....	8
Orchard st.,	Trumbull to Sixth.....	6
"	Sixth to w. side Elton Park.....	4
"	e. side of Elton Park to First.....	4
Orleans st.,	Atwater to Jefferson.....	10
"	Jefferson to 100 ft. n. of n. of Wilkins.....	8
"	Congress to 75 ft. n. of n. of Wilkins.....	24
"	crossing Leland, s. side	6
"	Alexandrine to s. line of Canfield.....	6
"	crossing s. side of Canfield 30 ft.....	20
"	Garfield to 252 ft. n. of.....	4
"	252 ft. n. of Garfield to 196 ft. n. of Forest.....	6
"	Trombly to Lyman	4
Ottawa st., e. from	Thirteenth 130 ft.....	3
Otis st., e. from	Junction 300 ft.....	4
"	300 ft. e. of Junction to alley w. of Thirty-first.....	4
Owen ave.,	16-in. main in Woodward to 1,220 ft. e. of Woodward.....	6
Pallister ave.,	280 ft. w. of to Hamilton Boulevard.....	6
"	crossing w. side of Woodward.....	6
Palmer ave.,	Woodward to 254 ft. w. of w. of Brush.....	4
"	254 ft. w. of to w. line of Brush.....	6
"	crossing w. side of Brush.....	4
"	crossing e. side of Brush.....	6
"	crossing Beaubien and St. Antoine, n. and s. sides.....	4
"	crossing Hastings e. to w. lines.....	6
"	crossing Russell and St. Aubin.....	4
"	e. line of St. Aubin to 129 ft. w. of Dubois.....	6
"	129 ft. w. of Dubois to e. line of Grandy.....	4
"	Mitchell to McDougall	6
"	crossing w. side of Moran.....	6
"	20 ft. e. of w. of Moran to 190 ft. e. of same.....	4
"	190 ft. e. of e. of Moran to 300 ft. e. of same.....	6
"	4 ft. e. of w. of Mt. Elliott to 159 ft. e. of Meldrum.....	6
"	Townsend to 235 ft. e. of Baldwin.....	6
"	235 ft. e. of Baldwin to Van Dyke.....	4
"	alley s. of (or private st. n. of Ferry), 263 ft. w. to Rivard	3
"	alley s. of (or private st. n. of Ferry), crossing w. side of Rivard	4
Park ave.,	Dix to Toledo	6
"	(east of city limits), Mack to 124 ft. n. of n. of Warren....	6

LOCATION.	DIAM. INCHES.
Park pl. east, Michigan to s. line of State.....	4
" crossing State	6
Park st., Woodward to Columbia	16
" Columbia to Bagg	8
" Bagg to Peterboro	6
" Woodward to Washington	6
Parker ave., 6 ft. n. of s. of alley n. of Jefferson to 250 ft. n. of Coe....	6
" 842 ft. s. of, to 534 ft. n. of Mack.....	6
Parkman ave., 473 ft. w. of Seventh to Hamilton Boulevard.....	4
" w. line of Woodward to 16-in. main.....	6
Parsons st., Cass to Woodward	4
Pennsylvania ave., Jefferson to 410 ft. n. of n. of Kercheval.....	6
" 145 ft. s. of Mack to 50 ft. n. of Elsa.....	6
Perrien Park, $\frac{1}{2}$ ft. w. of e. of Chene, e. 410 ft.....	4
Perry st., Humboldt to Eighteenth.....	4
" Harrison to Twelfth	6
" National to alley w. of Trumbull.....	4
" alley e. of Trumbull to Grand River.....	4
" alley s. of, alley w. of Eighth to alley w. of Sixth.....	4
Peterboro st., Cass to Woodward.....	4
Philadelphia ave., e. from Russell 389 ft.....	4
Pierce st., Dequindre to Jos. Campau.....	4
Pine st., crossing e. side of Twelfth.....	4
" e. line of Twelfth to National.....	3
" National to Grand River	4
Pitcher st., Seventh to Sixth	4
" Greenwood to 150 ft. w. of Fourth.....	4
" 150 ft. w. of, to Fourth.....	3
" alley e. of Third to Cass.....	4
Pingree ave., Hamilton Boulevard to Woodward.....	6
Piquette ave., Sullivan to Eighteenth.....	4
" Fourteenth to e. line of same.....	6
" e. line of Fourteenth to Wabash.....	4
" Twelfth, crossing e. side.....	6
" e. line of Twelfth to w. line of Avery.....	4
" Lincoln to Trumbull	6
" Greenwood to 124 ft. e. of e. of Fifth.....	6
" Woodward to Beaubien	4
" Beaubien to Russell	6
" Dubois to 186 ft. e. of e. line of same.....	6
" 186 ft. e. of e. of Dubois to Chene, e. line.....	4
" e. line of Chene to Grandy.....	6
" Mitchell to 32 ft. e. of e. of McDougall Boulevard.....	6
" 32 ft. e. of e. of Boulevard to Collins, w. line.....	4
" w. line of Collins to 326 ft. w. of Mt. Elliott.....	6
" 326 ft. w. of to Mt. Elliott.....	4
Pleasant ave., n. from River st. 515 ft.....	4
Plum st., Trumbull to alley e. of.....	6
" alley e. of Trumbull to Second.....	4
Plumer st., Livernois to Welch.....	4
" Wesson to 283 ft. w. of Junction.....	6
" 283 ft. w. of Junction to w. line of McKinstry.....	4
" crossing w. side of McKinstry.....	6
" alley s. of, alley w. of Morrell to 614 ft. w. of alley w. of McKinstry	6
" alley s. of, 614 ft. w. of, to alley w. of McKinstry.....	4
Pollard st., 1,242 ft. w. of, to Jos. Campau.....	4

LOCATION.		DIAM. INCHES.
Poplar st.,	Twenty-fourth to 184 ft. w. of Twenty-third.....	6
"	184 ft. w. of Twenty-third to Tillman.....	4
"	Maybury to 376 ft. e. of same.....	4
"	51 ft. w. of Sullivan to Humboldt.....	6
"	w. line of Fifteenth to 110 ft. e. of Wabash.....	4
"	110 ft. e. of e. of Wabash to Thirteenth.....	6
Porter st.,	crossing Campbell	6
"	Ferdinand to McKinstry.....	4
"	Scotten to w. line of Hubbard.....	3
"	crossing Hubbard, w. side.....	4
"	Vinewood to e. line of W. Boulevard.....	6
"	e. line of W. Boulevard to Twenty-second.....	4
"	23 ft. e. of w. of Twenty-second to 20 ft. w. of e. of Twen- tieth	3
"	20 ft. w. of e. of Twentieth to 30 ft. w. of e. of Fourteenth..	10
"	e. from Fourteenth 172 ft.....	3
"	Thirteenth to 210 ft. w. of Twelfth.....	4
"	210 ft. w. of to Twelfth.....	3
"	31 ft. w. of e. of Fourteenth to 9 ft. w. of w. of Tenth.....	13
"	alley s. of, 8 ft. w. of e. of Thirteenth to 23 ft. e. of e. of same	4
"	alley s. of, 23 ft. e. of e. of Thirteenth to alley e. of same..	3
"	alley s. of, Twelfth to First.....	4
Prentiss ave.,	Greenwood to alley w. of Fourth.....	4
"	Third to Cass	4
"	alley s. of, from Second e. 150 ft.....	3
Preston st.,	McDougall to Mt. Elliott.....	4
Private road,	private way (e. of Russell), s. from Clay 405 ft.....	4
Pulford ave.,	Gratlot to Mt. Elliott.....	4
"	Meldrum to Beaufait.....	4
Putnam ave.,	Fourteenth to Wabash.....	4
"	w. line of Thirteenth to 185 ft. w. of Twelfth.....	4
"	185 ft. w. of, to Twelfth.....	3
"	Twelfth to Trumbull	4
"	Lincoln to Fourth	4
"	Third to 323 ft. e. of same.....	4
"	323 ft. e. of Third to alley w. of Second.....	6
"	318 ft. w. of to Cass (n. lawn).....	6
"	5 ft. e. of w. of alley e. of Second to w. line of Cass (s. lawn)	6
"	w. line of Cass to 60 ft. w. of Woodward.....	4
"	60 ft. w. of to Woodward.....	6
Railway ave.,	Scotten to La Salle.....	6
Randall st.,	crossing w. side of Twenty-third 36 ft.....	4
Randolph st.,	alley s. of Atwater to Jefferson.....	4
"	Atwater to 24-in. main in Cadillac square.....	3
"	Larned to Congress	4
"	Congress to s. line of Gratlot.....	6
"	crossing Gratlot	10
"	Gratlot to Adams	6
"	alley e. of, alley s. of Fort to Champlain.....	4
"	alley e. of, alley s. of Macomb to Gratlot.....	4
Ranapach st.,	Livernois to Hammond	4
Raynor st.,	Clinton to Gratlot	4
Reed pl.,	235 ft. w. of to Greenwood.....	4
"	Greenwood to 36 ft. w. of Fourth.....	3
"	36 ft. w. of to Fourth.....	4

LOCATION.	DIAM. INCHES.
Reeder ave., 433 ft. w. of Campbell to Junction.....	4
Regular ave., Military to Cavalry	6
Reservoir grounds, n. of basin to 30-in. branch.....	24
s. and w. sides of basin.....	24
Rich st., Twenty-eighth to Clark.....	6
Clark to Scotten	4
Vinewood to 204 ft. e. of same.....	4
204 ft. e. of Vinewood to Twenty-seventh.....	6
Riopelle st., Atwater to Jefferson.....	8
Jefferson to Larned	12
Larned to Adelaide	8
Adelaide to 218 ft. n. of Hancock.....	6
Frederick to Kirby	6
alley e. of, Willis to Canfield.....	4
alley e. of, Garfield to 233 ft. n. of same.....	4
alley e. of, 233 ft. n. of Garfield to alley s. of Hancock....	6
Rivard st., Atwater to Jefferson.....	8
Jefferson to Clinton	10
Clinton to 9 ft. s. of Mullett.....	6
Mullett to Gratiot	10
Gratiot to Watson	4
Elliot to 90 ft. s. of Warren.....	4
90 ft. s. of Warren to 21 ft. n. of s. of Farnsworth.....	6
21 ft. n. of s. of Farnsworth to 36 ft. n. of s. of Kirby.....	16
Kirby to 221 ft. n. of Palmer.....	4
221 ft. n. of Palmer to alley n. of Harper.....	6
crossing Piquette	4
5 ft. s. of, to 153 ft. n. of N. Boulevard.....	6
153 ft. n. of N. Boulevard to Clay.....	4
n. from Clay 1,173 ft.....	6
Larned to Congress	4
River st., 55 ft. w. of w. of Dearborn to w. line of city limits.....	6
w. line of city limits to Campau.....	6
Campau to Pleasant	8
Pleasant to 75 ft. e. of Swain.....	6
525 ft. w. of Twenty-fourth to w. side of M. C. R. R. tracks..	8
crossing M. C. R. R. from w. to e. side 270 ft.....	6
e. side of M. C. R. R. tracks to Sixth st.....	8
Sixth to Fifth and Fourth to Third.....	4
alley s. of, Third to Second.....	4
Roby st., n. from Ferry 325 ft.....	4
Rohns ave., Goethe to 1,233 ft. n. of n. of Mack.....	6
360 ft. s. of Chapin to 800 ft. s. of Gratiot.....	8
800 ft. s. of Gratiot to Harper.....	6
Rolfe pl., 22 ft. s. of n. of Mack to 521 ft. n. of same.....	6
Rollin st., 41 ft. w. of e. of Wesson to 336 ft. e. of e. of same.....	6
Romeyn st., Cavalry to Campbell	6
Campbell to Junction	4
Rose st., Twentieth to Eighteenth.....	4
Rosedale ave., 16-in. main to e. line of Woodward.....	6
e. line of Woodward to w. line of Oakland.....	4
w. line of to Oakland.....	6
Rowena st., Woodward to 23 ft. e. of w. of John R.....	4
23 ft. e. of w. of John R. to 23 ft. e. of w. of Brush.....	8
23 ft. e. of w. of Brush to Riopelle.....	4
Rowland st., 24-in. main in Michigan to Grand River.....	8

	LOCATIONS.	DIAM. INCHES.
Russell st.	crossing to a line of Congress.....	6
	crossing to Macomb.....	8
	Hubert to Watson.....	8
	Watson to Canfield.....	6
	crossing to a line of Hendrie.....	10
	a line of Hendrie to a line of Piquette.....	8
	a line of Piquette to Alger.....	6
	a line of Chase to Fort.....	4
	a line of Willis to 220 ft. n. of same.....	4
St. Aubin st.	220 ft. e. of Dequindre to 200 ft. w. of St. Aubin.....	4
	200 ft. w. of to St. Aubin.....	2
St. Aubin st.	Atwater to Congress.....	8
	Congress to a line of Champlain.....	6
	crossing Champlain.....	8
	a line Champlain to n. line of Gratiot.....	6
	Jefferson to Congress.....	4
	Catherine to Elizabeth.....	12
	Elizabeth to Adelaide.....	6
	Adelaide to Watson.....	8
	Watson to n. line of Farnsworth.....	6
	crossing Frederick and Palmer.....	6
	a line Medbury to s. line of N. Boulevard.....	6
	crossing N. Boulevard s. side to 24-in. main.....	8
	alley e. of N. Boulevard to Custer.....	3 & 4
St. Aubin ave.	Atwater to 22 ft. n. of n. of Harper.....	6
	22 ft. n. of n. of Harper to Trombly.....	8
	Trombly to 27 ft. n. of s. of Clay.....	10
	Clay to 22 ft. n. of Danforth.....	6
	Larned to Congress.....	12
	Congress to Champlain.....	26
	alley e. of Kirby to Palmer.....	4
St. Aubin ave.	202 ft. s. of Jefferson to 8-in. main in Jefferson.....	4
St. Aubin pl.	Nineteenth to alley w. of Eighteenth.....	4
St. Joseph st.	Russell to Riopelle.....	2
	e. line of Riopelle to 110 ft. e. of St. Aubin.....	4
	110 ft. e. of St. Aubin to w. line of Chene.....	2
	crossing Chene.....	4
	e. line of Chene to 202 ft. e. of same.....	2
	202 ft. e. of Chene to Grandy, w. line.....	4
	w. line of Grandy to 18 ft. e. of w. of Jos. Campau.....	6
	w. line of McBougall to w. line of Collins.....	3 & 4
	w. line of Collins e. 188 ft.....	6
St. Paul ave.	Bellevue to e. line of Concord.....	4
	crossing Frontenac Boulevard.....	6
	e. line of Frontenac Boulevard to e. line of Field.....	4
	Townsend to Baldwin.....	4
	Iroquois to Burns.....	6
	Crane to alley w. of same.....	4
	Holcomb to Belvidere.....	6
St. Aubin st.	St. Aubin to 6 ft. e. of D., G. H. & M. R. R.....	6
	crossing Collins.....	6
St. Aubin st.	Twenty-fourth to Twenty-third.....	4
	Twenty-second to Twenty-first.....	4
St. Aubin st.	e. from McClellan 245 ft.....	4
Scholar Boulevard.	(n. and s. sides), at w. line of Woodward 8 ft.....	4
Scholar pl.	e. from Ellery 106 ft.....	6
	18 ft. e. of Ellery to Mt. Elliott.....	4

LOCATION.	DIAM. INCHES.
Scott st., Riopelle to e. line of St. Aubin.....	4
" e. line of St. Aubin to Dubois.....	3
" crossing Dubois to 156 ft. e. of same.....	4
" 156 ft. e. of Dubois to 499 ft. e. of Chene.....	3
" 499 ft. e. of Chene to Jos. Campau.....	4
" Orleans to Chene	30
Scotten ave., Fort to Dix	6
" Dix to Buchanan (s.).....	8
" Buchanan (s.) to Buchanan (n.).....	16
" Buchanan to McGraw	6
Scovel pl., crossing W. Boulevard to 24 ft. e of same.....	6
" 26 ft. w. of e. of Twenty-sixth to 203 ft. e. of same.....	6
" in Mound "Eckstrom" 50 ft.....	4
Sears ave., Holcomb to 193 ft. e. of McClellan.....	4
Second st., Front to Woodbridge	6
" Woodbridge to alley n. of Jefferson.....	10
" crossing Congress	10
" Abbott to alley s. of same.....	8
" Abbott to Grand River	10
" alley w. of, Front to alley n. of same.....	4
" alley w. of, alley s. of to Lewis.....	4
Second ave., High to 166 ft. n. of Henry.....	4
" Grand River to Bagg	10
" Bagg to s. line of Canfield.....	6
" crossing Canfield s. line to 20 ft. s. of n.....	8
" 20 ft. s. of n. to 30 ft. n. of Prentiss.....	6
" (e. side) 16 ft. s. of n. of Forest to 17 ft. s. of n. of Hancock	6
" crossing Forest s. line to 22 ft. n. of n. line.....	6
" (e. side) crossing Putnam and Merrick.....	6
" (w. side) crossing Putnam and Merrick.....	4
" 36 ft. s. of n. of Kirby to 2 ft. n. of n. of Colburn.....	6
" 24 ft. s. of n. of Colburn to s. line of N. Boulevard.....	6
" crossing N. Boulevard	8
" alley w. of, Forest to 28 ft. n. of s. of Merrick.....	6
" alley e. of, alley n. of Canfield to Prentiss.....	4
" alley e. of, 28 ft. n. of s. of Warren to 16 ft. n. of s. of Putnam	6
Secor pl., from Ferry to 267 ft. s. of s.....	4
Selden ave., Seventh to Sixth.....	4
" crossing Greenwood.....	4
" Greenwood to alley w. of Fourth.....	3
" alley w. of to Fourth.....	4
" Third to Woodward	4
" alley s. of, Greenwood to alley w. of Fourth.....	4
Seminole ave., 21 ft. s. of n. of Agnes to n. line of St. Paul.....	6
" alley e. of, 6 ft. n. of s. of alley n. of Jefferson to n. line of Champlain	4
" alley e. of, n. line of Champlain to 21 ft. s. of n. of Agnes	6
Seventh st., River st. to alley n. of Lafayette.....	8
" alley n. of Lafayette to Bagg	10
" Bagg to Grand River	8
" Grand River to Calumet.....	6
" crossing Calumet s. to n. line.....	8
" n. line of Calumet to 684 ft. n. of Stanley.....	6
" alley w. of, alley s. of to Spruce.....	3

LOCATION.	DIAM. INCHES.
Spruce st., alley s. of, from second alley w. of to first alley w. of Seventh	3
Standish st., Twentieth to Foundry	6
Stanley ave., Tillman to Williams	6
" Grand River to Sullivan	6
" crossing Humboldt, w. side	4
" 25 ft. w. of e. of Humboldt to 2 ft. e. of e. of Eighteenth	6
" Stanton to Sixteenth	6
" crossing Fourteenth	6
" 183 ft. w. of to Twelfth	4
" Commonwealth to Seventh	4
" Seventh to Greenwood	6
Stanton ave., Merrick to Antoinette	6
" crossing N. Boulevard	6
Stark ave., Livernois to Welch	4
State st., Cass to Woodward	10
" crossing Washington e. side 24 ft.	24
" 80 ft. w. of e. of Washington to Woodward	30
" alley s. of, from Cass to alley w. of Washington	4
" alley s. of, from alley e. of Washington to e. line of Griswold	4
" alley s. of, e. line of Griswold to alley w. of Woodward	8
Stevens ave., 26 ft. n. of s. of Gratiot to 366 ft. n. of same	6
Stimson pl., Cass to Woodward	4
Stewart st., Bellevue to Canton	6
Sullivan ave., Michigan to 463 ft. n. of Buchanan	6
" crossing Warren	6
" 25 ft. s. of n. of Stanley to Baltimore	6
" crossing N. Boulevard	8
Summit ave., River st. to Fort	6
Superior st., crossing Brush	4
" 3 ft. e. of e. of Brush to 220 ft. w. of Beaubien	6
" 220 ft. w. of to Beaubien	4
" Beaubien to Russell	6
" Riopelle to Dequindre	4
" Dequindre to St. Aubin	6
" crossing e. side of St. Aubin	4
" St. Aubin to w. line of Chene	3
" crossing Chene	4
" e. line of to 343 ft. e. of Chene	3
" 343 ft. e. of Chene to Mitchell	4
" McDougall to Gratiot	4
Swain ave., 40 ft. s. of Wabash R. R. to Fort	6
Sycamore st., Wabash to Harrison	4
" National to alley w. of Trumbull	4
" 123 ft. w. of to Grand River	6
Sylvan st., Vinewood to 65 ft. e. of same	4
" 65 ft. e. of Vinewood to 105 ft. w. of Twenty-seventh	6
" 105 ft. w. of to Twenty-seventh	4
Sylvester st., Gratiot to Mt. Elliott	4
" Beaufait to Concord	4
Taylor ave., 2 ft. w. of e. of Hamilton Boulevard to 16-in. main in Woodward	6
Tenth st., River st. to Abbott	8
" Abbott to Michigan	24
Theodore st., John R. to 106 ft. e. of Riopelle	4
" 268 ft. w. of St. Aubin to w. line of Dubois	4

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	LOCATION.	DIAM. INCHES.
	are st., crossing Dubois	6
	e. line of Dubois to Grandy.....	4
	11 ft. e. of w. of Jos. Campau to 27 ft. w. of e. of Mc- Dougall	6
	crossing Collins	6
	crossing Moran w. side.....	6
	e. from Moran 375 ft.....	4
	crossing Mt. Elliott main to main.....	6
	15 ft. w. of e. of Mt. Elliott to w. line of Beaufait.....	4
	Helen to 191 ft. e. of same.....	6
	alley s. of, e. and w. of Davis pl. 150 ft.....	4
Third st.	Front to s. line of River st.....	6
	s. line of River st. to Larned.....	8
	Larned to alley n. of.....	6
	Larned to Fort st.	24
	Abbott to High	6
	alley e. of, alley n. of Michigan to Lewis.....	4
Third ave.	Grand River to Bagg.....	8
	Bagg to Calumet, s. line.....	6
	s. to n. line of Calumet	8
	n. line of Calumet to Holden, n. line.....	6
	crossing Baltimore	6
	Calumet to Canfield	20
	alley e. of, from Henry to Brainard.....	4
Thirtieth st.	River st. to Fort.....	4
	Fort to Howard	6
	alley s. of Porter to Porter.....	4
	Porter to Ash	6
	crossing Myrtle	6
	Magnolia to n. line of Grand River.....	6
	n. line of Grand River to 15 ft. n. of Canfield.....	4
	15 ft. n. of Canfield to Hancock.....	6
	Hancock to 150 ft. n. of.....	4
	150 ft. n. of Hancock to 20 ft. n. of s. of Kirby.....	6
	25 ft. n. of s. of Harper to 210 ft. n. of n. of same.....	6
	alley w. of, Bagg to Myrtle.....	6
Thirtieth st.	30 ft. s. of Jackson to Buchanan.....	6
	Devereaux to 153 ft. s. of Warren.....	6
Thirty-first st.	Michigan to 250 ft. s. of Warren.....	6
	150 ft. s. of to Norton.....	6
Thirty-second st.	Michigan to 15 ft. s. of Buchanan.....	4
	15 ft. s. of to 85 ft. n. of Buchanan.....	6
	85 ft. n. of to 385 ft. n. of Buchanan.....	8
	385 ft. n. of Buchanan to 82 ft. n. of Horatio.....	6
Thirty-third st.	Michigan to Horatio	6
Thirty-fourth st.	Michigan to 135 ft. n. of Jackson.....	8
	64 ft. s. of to 132 ft. n. of Buchanan.....	8
	132 ft. n. of Buchanan to 125 ft. n. of Rich.....	6
Thirty-fifth st.	Michigan to n. line of Buchanan.....	6
	n. line of Buchanan to 277 ft. n. of n. of Rich.....	8
Thompson ct.	n. of Forest 115 ft.....	4
Tillman ave.	Michigan to 300 ft. n. of Merrick.....	6
	Hudson to McGraw	6
Twelfth ave.	Livernois to McKinstry.....	6
	McKinstry to 390 ft. e. of Scotten.....	4
	390 ft. e. of Scotten to Hubbard.....	6
	w. line of W. Boulevard to Twenty-fifth.....	6

LOCATION.	DIAM. INCHES.
Tonti st., Van Dyke to Maxwell	6
Torrey st., Twenty-eighth to Lovett.....	4
" crossing w. side of Scotten.....	4
Townsend ave., Jefferson to 36 ft. n. of s. of Waterloo.....	6
" n. from Mack 208 ft.....	6
" 208 ft. n. of Mack to s. line of Gratiot.....	4
" s. line of to 8-in. main in Gratiot	8
" 8-in. main in Gratiot to n. line of Palmer.....	6
Trombly ave., Oakland to Hastings	6
" Crystal to Russell	4
" Russell to 20 ft. e. of w. of Dubois.....	8
" 183 ft. w. of to Chene.....	6
" Chene to w. line of Collins.....	4
" crossing Collins	6
" e. line of Collins to 72 ft. e. of Ellery.....	4
" 72 ft. e. of Ellery to e. line of Mt. Elliott.....	6
Trowbridge ave., 16-in. main to e. line of Woodward.....	6
" e. line of to 511 ft. e. of Woodward.....	4
Trumbull ave., 21 ft. s. of n. of Fort to 9 ft. n. of s. of alley s. of Abbott	8
" 9 ft. n. of s. of alley s. of Abbott to 24-in. main in Abbott	10
" Abbott 24-in. main to 8-in. main in Michigan.....	8
" Michigan to Plum	6
" Grand River to alley n. of.....	6
" Calumet to Forest	8
" Forest to 497 ft. n. of G. T. R. R.....	6
" 497 ft. n. of G. T. R. R. to 50 ft. n. of Piquette.....	8
" 50 ft. n. of Piquette to Holden.....	6
" alley w. of, Cherry to Pine.....	3
" alley w. of, Pine to Myrtle	4
" alley w. of, alley n. of Grand River to Calumet.....	6
" alley e. of, Plum to Sycamore.....	6
Tuscola st., Fourth to Third	6
" alley s. of, Greenwood to alley w. of Fourth.....	4
Twelfth st., 468 ft. s. of to River st.....	4
" 17 ft. s. of n. of River st. to 31 ft. s. of n. of Lafayette.....	8
" 26 ft. s. of n. of Howard to 25 ft. s. of n. of Baker.....	8
" Baker to Calumet	6
" Calumet to s. line of Boulevard.....	8
" s. line of to 16 ft. s. of n. line of Boulevard.....	10
" alley w. of, from 121 ft. s. of to Porter.....	4
" private alley e. of, from 12-in. main in Porter to alley n. of	4
Twentieth st., Fort to Michigan	6
Twenty-first st., Fort to Standish	4
" crossing Porter s. to n. line.....	6
" alley w. of, Brevoort to Webster.....	4
Twenty-second st., Fort to Dalzelle.....	6
Twenty-third st., Fort to Magnolia	6
" Magnolia to 35 ft. s. of Linden.....	8
" 35 ft. s. of Linden to 100 ft. n. of Poplar.....	4
" 100 ft. n. of Poplar to Kirby.....	6
" Kirby to s. line of McGraw.....	4
" s. line of McGraw to Ivy pl.....	6
Twenty-fourth st., River st. to Fort	4
" Fort to Baker	6

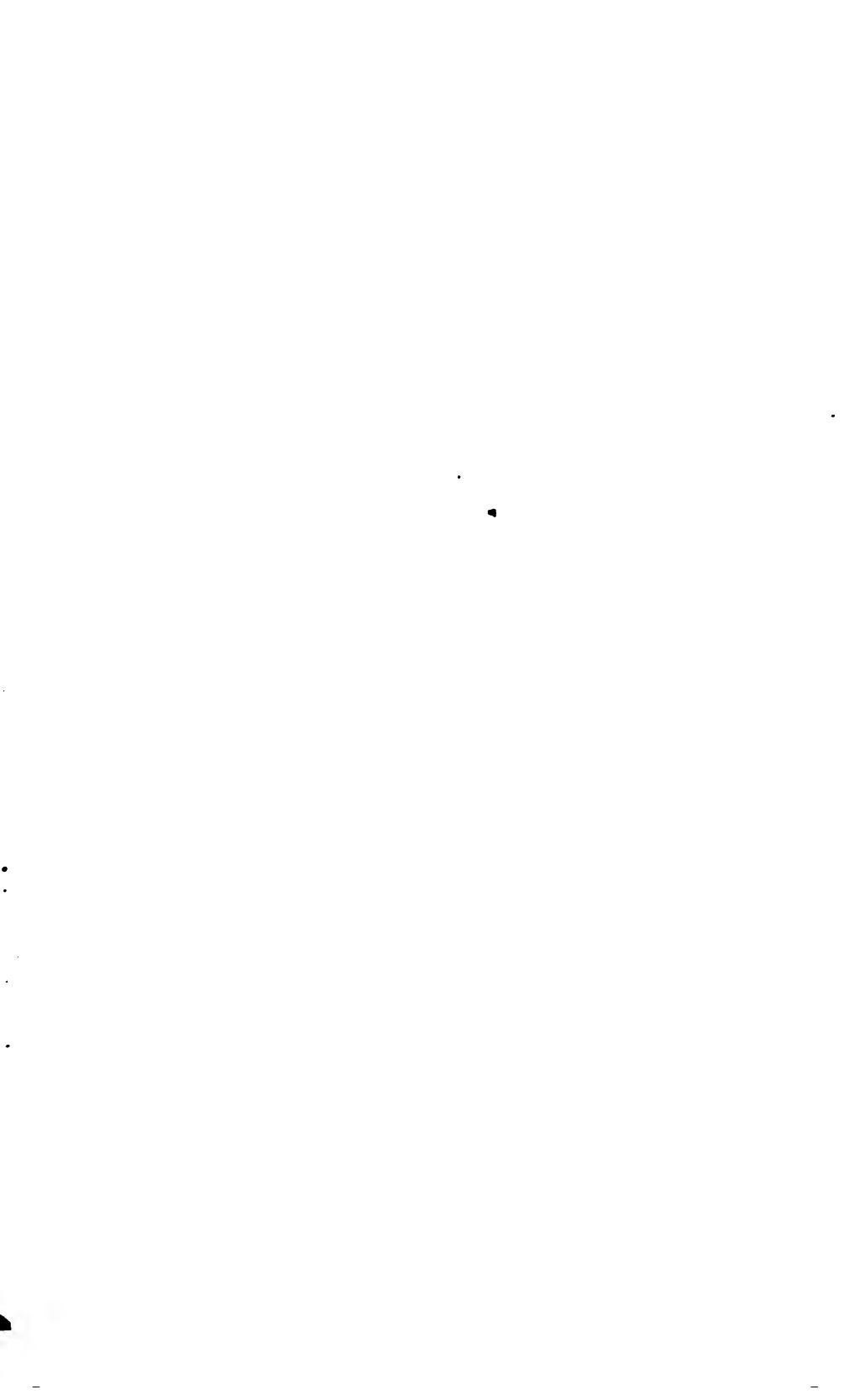
	LOCATION.	DIAM. INCHES.
Twenty-fourth st.	Baker to s. line of Michigan	8
"	s. line of to 53 ft. n. of Michigan	15
"	53 ft. n. of to 138 ft. n. of Michigan	13
"	138 ft. n. of to 192 ft. n. of Michigan	20
"	192 ft. n. of Michigan to Butternut	24
"	Butternut to Buchanan	10
"	Buchanan to n. line of McGraw	8
"	n. line of McGraw to Chope pl.	6
Twenty-fifth st.	Howard to Baker	4
"	Baker to Toledo	6
"	E st. to Michigan	4
"	Michigan to Hancock	6
"	crossing Warren	6
"	135 ft. s. of Hudson to n. line of McGraw	6
Twenty-sixth st.	213 ft. s. of E st. to 146 ft. s. of Hancock	6
"	146 ft. s. of to 421 ft. n. of Hancock	6
"	421 ft. n. of Hancock to McGraw	8
"	24 ft. n. of s. of Brown pl. to 34 ft. n. of s. of Grand River	6
Twenty-seventh st.	Myrtle to s. line of Buchanan	6
"	crossing Buchanan	8
"	n. line of Buchanan to 22 ft. n. of s. of McGraw ..	6
Twenty-eighth st.	Michigan to 14 ft. n. of Rich	6
Twenty-ninth st.	545 ft. s. of Michigan to Buchanan	6
Uden st.	Fifth to Fourth	3
Uden st.	McKinstry to Clark	4
Van Dyke ave.	Jefferson to 150 ft. n. of Waterloo	8
"	276 ft. s. of n. line of to n. line of Worcester	8
"	n. line of Worcester to Mack	6
"	Mack to n. line of Gratiot	8
"	Gratiot to Harper	6
"	Jefferson connecting with 42-in. main 23 ft. of	10
Vincennes st.	McClellan to 173 ft. e. of e. of same	6
Vine st.	crossing e. side of Fifth	4
"	Fifth to Fourth	3
Vinewood ave.	Fort to Buchanan	24
"	Buchanan to Merrick	10
"	Merrick to Grand River	8
"	Fort to 430 ft. n. of Toledo	6
"	F st. to Buchanan	6
"	crossing Vinewood s. of M. C. R. R. between mains 23 ft.	6
Virginia ave.	Hamilton Boulevard to w. line of Woodward, n. and s. sides	4
"	.5 ft. e. of w. line of to 16-in. main in Woodward	6
Vlager st.	Twenty-eighth to Lovett	6
"	crossing e. side of Scotten	6
"	La Salle to Vinewood	6
Wabash ave.	n. line of M. C. R. R. to n. line of Ottawa	6
"	n. line of Ottawa to s. line of Buchanan	4
"	s. line of Buchanan to s. line of Grand River	8
"	crossing Grand River	6
"	n. line of Grand River to 18 ft. s. of s. line of L. S. & M. S. R. R.	8
"	18 ft. s. of s. of L. S. & M. S. R. R. to 186 ft. n. of Piquette	6
"	crossing N. Boulevard	6

LOCATION.	DIAM. INCHES.
Walbridge st., Baldwin to Van Dyke.....	6
Walker st., Atwater to Jefferson.....	4
Walnut st., 284 ft. w. of to Van Dyke.....	6
Warren ave., w. line of Scotten to Grand River.....	6
" Sixteenth to Fourteenth	4
" 25 ft. e. of w. of Fourteenth to 7 ft. e. of e. of alley e. of same	6
" 7 ft. e. of e. of alley e. of Fourteenth to Avery.....	4
" 126 ft. w. of to Twelfth, n. side.....	4
" Trumbull to 106 ft. w. of Seventh.....	6
" 106 ft. w. of Seventh to Greenwood.....	4
" Greenwood to Third	6
" Third to Cass	8
" 6 ft. e. of w. of Cass to 106 ft. e. of Riopelle.....	4
" Warren ct. to w. line of Dubois.....	4
" crossing Dubois 56 ft.....	6
" e. line of Dubois to e. line of Grandy.....	4
" 12 ft. e. of w. of to 10 ft. w. of e. of Jos. Campau.....	6
" crossing Collins	6
" w. line of Moran to 63 ft. e. of Detloff ct.....	6
" 2 ft. e. of w. of Mt. Elliott to 178 ft. e. of e. of same.....	6
" Helen to 228 ft. e. of same.....	4
Warren ct., 181 ft. s. of to 56 ft. n. of Warren	4
Warsaw pl., 17 ft. e. of Dequindre to St. Aubin.....	6
Washington ave., Michigan to State.....	30
" Michigan to Park	10
" alley w. of, from alley s. of State to alley s. of Bagley	4
" alley e. of, from alley s. of State to alley w. of Woodward	4
Waterloo st., Dequindre to Jos. Campau.....	4
" Jos. Campau to Burlage pl.....	6
" Burlage to Mt. Elliott	8
" Mt. Elliott to 56 ft. e. of Beaufait.....	4
" 56 ft. e. of Beaufait to Bellevue.....	6
" Field to Sheridan	6
" Townsend to Baldwin	6
Watson st., Woodward to Brush	4
" Brush to reservoir	24
" Dequindre to Chene	4
Wayne st., 173 ft. s. of to Woodbridge.....	4
" Woodbridge to Michigan.....	6
Webster pl., Twenty-second to alley e. of same.....	6
" Nineteenth to alley w. of Eighteenth.....	4
Webb ave., e. line of Hamilton Boulevard to w. line of Woodward... 4	
" w. line of Woodward to 16-in. main.....	6
Welch ave., Plumer to s. line of M. C. R. R.....	6
" 211 ft. s. of to 309 ft. n. of Stark.....	6
" s. line of Ingersoll to n. of city limits.....	6
Wesson ave., Toledo to Herbert	6
W. Boulevard, (both sides) Fort to Shady lane.....	4
" (west driveway) Shady lane to Baker.....	3
" (w. side) 18 ft. s. of n. of Shady lane to 33 ft. s. of n. of Baker	4
" (w. side) n. line of Dix to n. line of Toledo.....	4
" (w. side) E st. to 444 ft. s. of Michigan.....	6
" (w. side) 444 ft. s. of to s. line of Michigan.....	4

DEAR
DOCTOR

PLAN	
INDEX	
1. of Michigan to Myrtle.....	6
2. of Shady lane to 126 ft. n. of	6
3. of Trumbull.....	6
4. of Woodward.....	6
5. of same.....	6
6. of same.....	6
7. of same.....	6
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100. of same.....	6

LOCATION.		DIAM. INCHES.
Woodbridge st.,	24 ft. e. of w. of Woodward to 6 ft. e. of e. line of St. Antoine	8
"	6 ft. e. of e. line of St. Antoine to Dubois.....	6
"	300 ft. w. of to Jos Campau	6
"	Jos. Campau to 400 ft. e. of same.....	4
"	400 ft. e. of Jos. Campau to McDougall.....	6
"	325 ft. w. of to Leib.....	4
"	alley s. of, Bates to Randolph.....	4
"	alley s. of, Brush to 210 ft. e. of Beaubien.....	4
"	alley s. of, McDougall to Walker.....	4
Woodland ave.,	16-in. main to e. line of Woodward.....	6
"	e. line to 780 ft. e. of Woodward.....	4
Woodward ave.,	(e. side) s. from Atwater to 246 ft.....	3
"	(e. side) Milwaukee to 102 ft. s. of N. Boulevard.....	6
"	(e. side) 102 ft. s. of to N. Boulevard.....	4
"	(e. side) crossing s. side of Melbourne.....	6
"	(e. side) crossing Chicago Boulevard	6
"	(e. side) crossing Boston Boulevard	6
"	(w. side) from 171 ft. s. of to Atwater	4
"	(w. side) crossing Virginia ave.....	6
"	(w. side) crossing Shakespeare Boulevard.....	6
"	(w. side) crossing Schiller Boulevard.....	6
"	Atwater to Jefferson	16
"	Jefferson to Soldiers' Monument.....	24
"	Bagg to Edmund	24
"	Atwater to Adams	8
"	Adams to Baltimore	10
"	Baltimore to Clay	8
"	N. Boulevard to Woodland	16
"	Woodland to 15 ft. n. of city limits.....	12
"	High to 200 ft. n. of Canfield.....	4
"	alley e. of, alley s. of Atwater to alley s. of Jefferson	4
"	alley e. of, alley s. of Larned to alley s. of Cadillac square	4
"	alley e. of, alley s. of to Gratiot	6
"	alley e. of, Gratiot to 12 ft. s. of n. of John R.....	8
"	alley e. of, 12 ft. s. of n. of John R. to 172 ft. s. of Witherell	6
"	alley e. of (private alley), 80 ft. s. of to Witherell 97 ft.	3
"	alley e. of, alley s. of Elizabeth to s. line of Elizabeth	3
"	alley e. of, crossing s. side of Elizabeth	4
"	alley e. of, Elizabeth to Columbia	6
"	alley e. of, Columbia to Montcalm.....	4
"	alley w. of, Atwater to alley s. of Jefferson.....	4
"	alley w. of, alley s. of Larned to alley s. of Fort....	8
"	alley w. of, alley s. of State to Clifford.....	8
"	alley w. of, crossing n. side of Clifford.....	6
"	alley w. of, n. line of Clifford to alley s. of Park....	4
"	alley w. of, Montcalm to High.....	3
Woodward ave. terrace,	Woodward to w. line of John R.....	4
Wreford pl.,	crossing w. side of Vinewood.....	6
"	crossing Hubbard Boulevard	6
Wreford ave.,	Grand River to Eighteenth.....	4
Zender pl.,	Ellery to 288 ft. e. of same.....	6
"	288 ft. e. of Ellery to Mt. Elliott.....	4





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J. E. Kirby, Pres.

D. W. H. Moreland,

A. L. Stephens, Secy.

E. W. Chandler.

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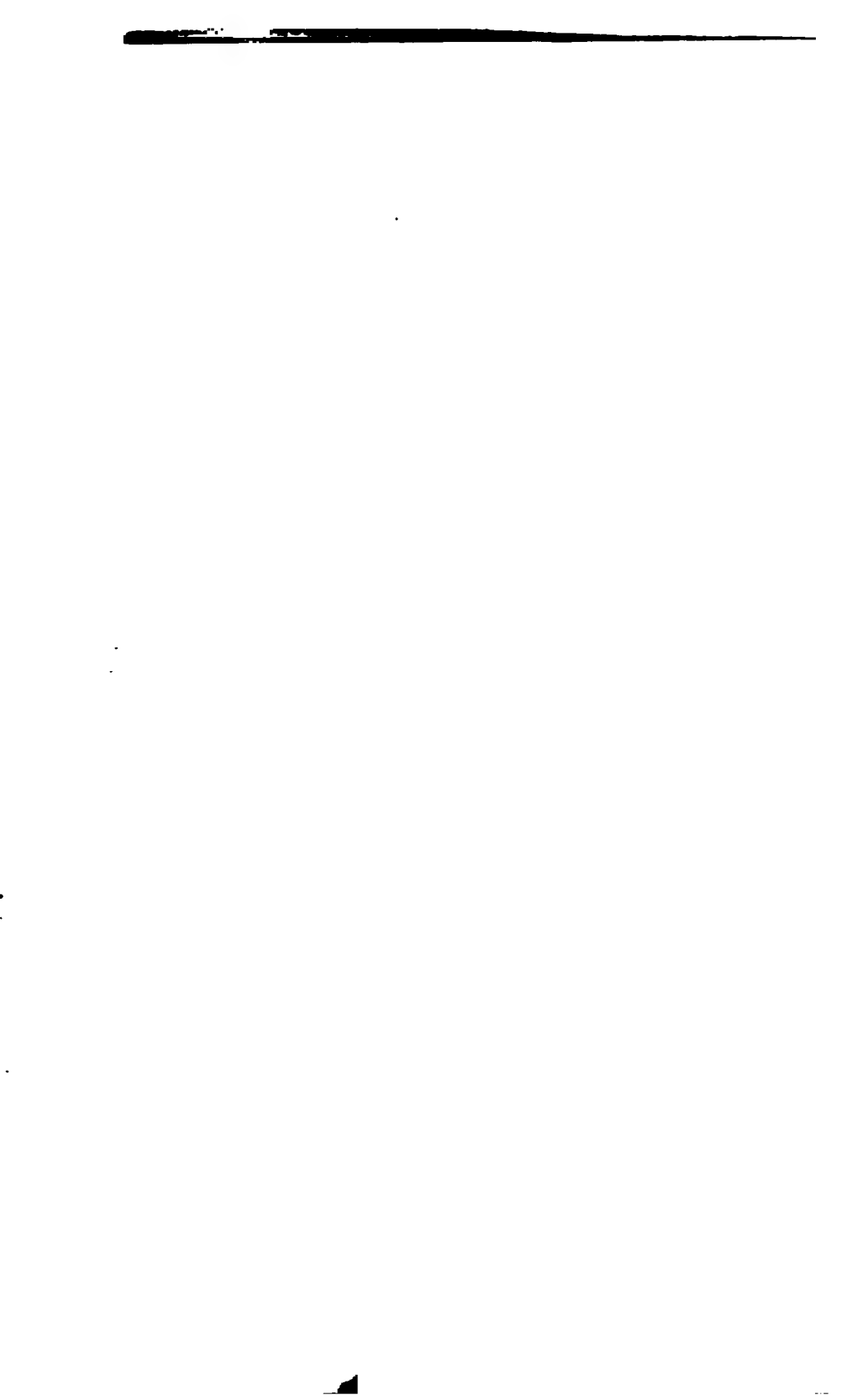
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D. W. H. Moreland,

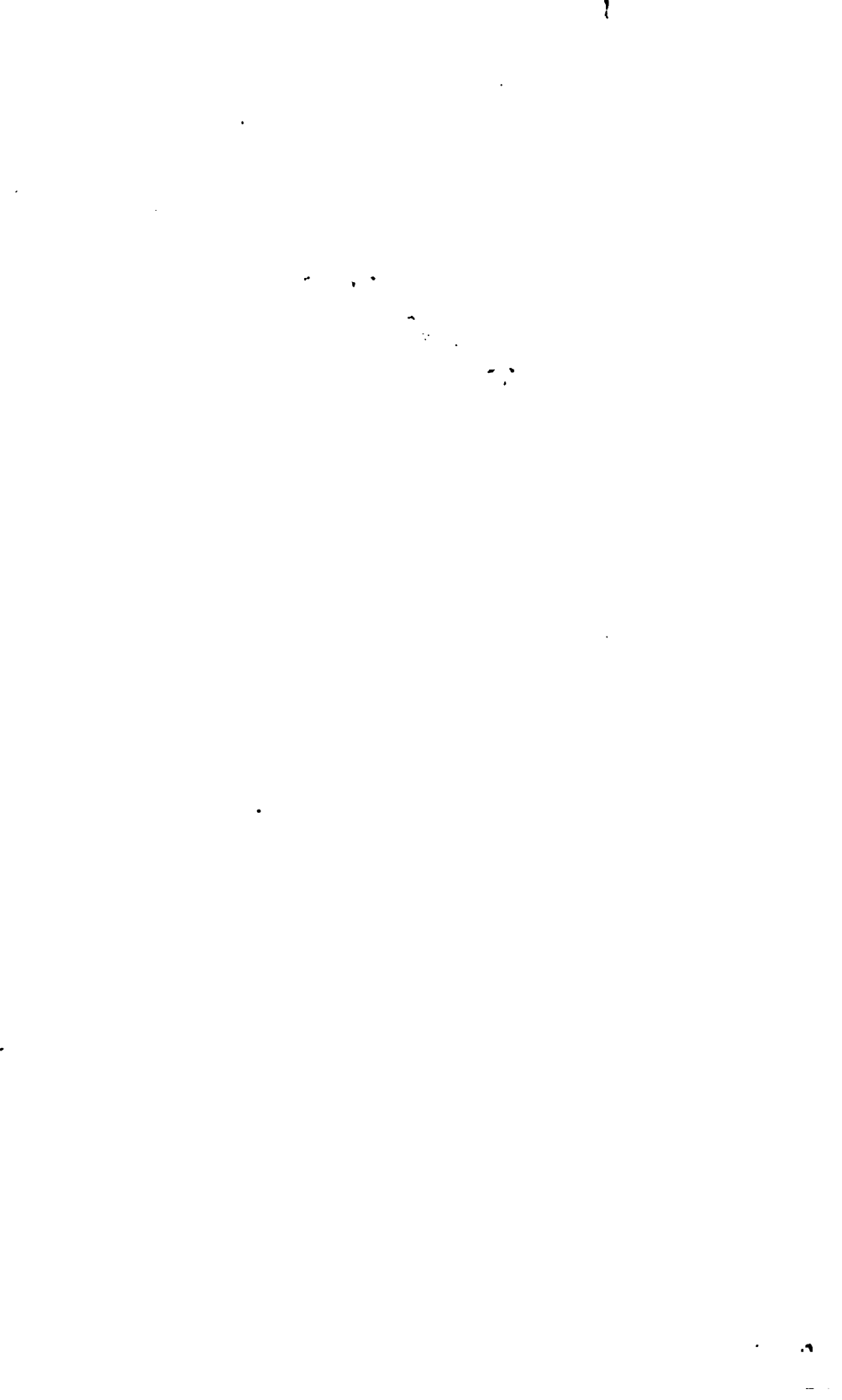
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